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POCKET BOOK.

BY THE LATE

BERTRAND STEWART

CAPTAIN,

WEST KENT (QUEEN'S OWN) YEOMANRY.

SIXTH EDITION

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"For though it may be said that success in war is the outcome of the three C's—Courage, Common sense, and Cunning—yet Study has also a great say in the matter."

Lieut.-General Sir R. S. S. Baden-Powell.

184582

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I desire to record my obligation to Major T. A. Goodwin, D.S.O., R.A.M.C., for the portion relating to First Aid and Sanitation ; to Major F. Eassie, D.S.O., A.V.D., for the portion relating to Veterinary First Aid, and for many of the principles contained in the prevention of diseases and injuries, and for certain additions to the previous portion on Horse Management ; and also to Captain C. W. Biggs, R. E., for many plates throughout the book.

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I have consulted the following works :—

" The Official Manuals," " Authorised Translation from the German Official Accounts of the Franco-German War," " Duties of the General Staff," by the late General von Schellendorf, " Official History of the Russo-Japanese War," " The British Officers' Reports " on that war, " Stonewall Jackson," " Military Sketching and Reconnaissance," by Lieut.-Col. F. Mockler-Ferryman, " Cavalry in Future Wars," by General von Bernhardi, translated by Mr. C. S. Goldman, " Cavalry Tactics," the *Times* articles on the Russo-Japanese War, and " North-West Frontier Warfare," by Major Sherstone.

B. S.

PREFACE

TO FOURTH EDITION.

In the fourth Edition the following entirely new subjects were added :—

The Composition of Regiments, Brigades, and Divisions in the Territorial Force and the Indian and Colonial Forces.
Information dealing with and especially applicable to the Forces in Australia, Canada, and India.
The Laws and Customs of War.
Fire Tactics and Machine Guns.
Trajectories.
Employment of Cyclists.
The writing of Appreciations.
Inland Water and Mechanical Transport.
Indian Railway Transport.
Entrainment of Artillery and Transport.
Temporary repair of damaged vehicles.
Supply.
Ciphers.
Military Law.
Enlargement of Maps and the preparation of Sketches for Night Marches.
Aerial Reconnaissance.
Reconnaissance of a Coast for Defensive purposes.

Arrangements for a Landing.
Rafts.
Use of Homing Pigeons.

The portions on the following subjects have been considerably enlarged:—

Reconnaissance and Transmission of Information.
The Battle.
Night Operations.
Encampments.
Camp Cooking and Ovens.
Bridging.
Demolitions, including those in N.W. India.
Table of English and Foreign Equivalents;

while Railway, Sea, and Road Transport have been very largely added to, and the whole of the material which was in the Third Edition, with the exception of the Table of Rolling Stock and Foreign Conventional signs, which have been omitted in this Edition in order to save space, has been thoroughly revised and brought up to date.

The paragraphs relating to Frontier Warfare have, for the sake of convenience, been grouped together.

B. S.

LONDON, *January*, 1910.

PREFACE

TO FIFTH EDITION.

Since making a portion only of the revisions necessary to bring the present edition up to date, I have been imprisoned in a German fortress, and am therefore unable to complete them.

My thanks are accordingly due to Major C. W. Singer, R.E., for making many of the other necessary revisions and to him and to Mr. Roland Burrows, M.A., LL.D., for carrying out the duties of editor. I have also to thank Captain Maitland for revising the portion on aerial reconnaissance, and Major A. H. Cunningham and Captain C. W. Brand for work connected with the portions on India and Australia.

B. S.

June, 1912.

PREFACE

TO SIXTH EDITION.

DURING the spring of 1914, Captain Stewart was engaged in active preparations for this edition. On the outbreak of war he received an appointment on the Headquarter Staff of the Cavalry Division.

He was killed in action on the 12th of September at Braisne in the Battle of the Aisne.

As there is an ever-increasing demand for the book and the last edition is now exhausted, Captain Stewart's widow has thought it best to issue the present edition at once. This edition is substantially the same as the last with such alterations as Captain Stewart had already made. The war certainly has raised many new problems, but the necessary experience is not yet available for the incorporation of their solutions.

Mrs. Stewart desires to thank all those who so kindly assisted Captain Stewart in his work upon this book, especially Mr. Roland Burrows who has, as in the case of the two previous editions, kindly undertaken the work of seeing this edition through the press.

January, 1915.

PART I.

LAWS AND CONDITIONS OF WAR.

The following paragraphs give a summary of the laws and customs of War on land which affect regimental officers. Reference, in cases of difficulty, should be made to the texts of the Conventions which govern the conduct of armies in the field—the Convention concerning the laws and customs of war on land and other Conventions drawn up at the Hague in 1907, and the Convention for the amelioration of the condition of Sick and Wounded of Armies, drawn up at Geneva in 1906. These will be found in the Manual of Military Law.

Belligerent Forces.

War is made against the armed forces of the enemy and not against the peaceful inhabitants of a country.

Should inhabitants elect to take part in the fighting, they incur grave danger of being treated as marauders; to obtain the rights of soldiers they must comply with the following conditions:—

(*a*) Be commanded by a person, *e.g.* a commissioned officer or civilian of position, responsible for his subordinates;

(*b*) Wear a fixed distinctive emblem recognisable at a distance; a military head-dress and a badge sewn on the breast of the coat would be sufficient;

(*c*) Carry arms openly;

(*d*) Conduct their operations in accordance with the laws and customs of war. The notes given here will be an adequate guide as to what are the laws and customs of war.

Should inhabitants rise spontaneously to resist an invader *before* he has occupied their territory, only conditions (*c*) and (*d*) can be insisted on.

Cases of inhabitants who offend against these rules should be referred to the nearest staff; it is not the business of regimental officers to decide points of international law; but it is their duty to see that inhabitants who assist them are properly safeguarded, and that they comply with the conditions given above.

Prisoners of War.

It is forbidden to kill or wound an enemy who has laid down his arms, or is without means of defence, and surrenders. There is no international sign of surrender.

A prisoner may be required to give his true name and rank, but he cannot be called on to furnish any other information.

Prisoners must be humanely treated. All their personal belongings, except arms, horses, and military papers, remain their property. They may, however, be searched.

Prisoners may be fired on if they endeavour to escape; they may be confined in any manner as an indispensable measure of safety, but they may not be killed merely because their presence is a danger or inconvenience.

Prisoners are the property of the Government; they cannot be paroled or released except by the highest authority on the spot. This might include the commander of an isolated detachment.

Means of injuring the Enemy.

It is forbidden to use poison or poisoned weapons; to kill or wound treacherously; to declare that no quarter will be given;

to use arms or projectiles calculated to cause unnecessary suffering, *e.g.* explosive bullets, bullets of irregular shape, saw-edge bayonets, etc. The improper use of the enemy's uniform is forbidden. Ruses, *e.g.* surprises, concealment of troops, use of enemy's watchword or language, and train wrecking, burning buildings, etc. are permitted, but treachery is forbidden.

Undefended localities may not be attacked or bombarded by the land forces; but a naval force may bombard an undefended locality to destroy stores and docks, or if a requisition has not been complied with.

Notice should be given of bombardment unless surprise is an element of success.

In a siege or bombardment, endeavour should be made to spare buildings dedicated to religion, art, science, or charitable purposes. These should be indicated by a special sign, for instance, a black and white flag or screen. Nothing, however, is laid down in land warfare except for hospitals (*see* next section, "Sick and Wounded.") In the case of naval bombardments, a screen divided into four parts by diagonal lines is prescribed, the upper and lower triangular portions are to be painted black, the side triangles white.

Sick and Wounded.

The red cross on a white ground is the emblem of the medical services of armies. A flag with this emblem (together with the national flag) is hoisted over medical establishments; a badge with this emblem is worn fixed to the left arm by the army medical *personnel* and any voluntary *personnel* authorised to assist it; and the emblem is marked on all army medical stores. This sign must always be respected and no injury done intentionally to the persons or property covered by it. Persons not in uniform who wear the badge must have a certificate of identity. Any case of doubt as to the right to use the emblem should be referred to a R.A.M.C. or staff officer.

The army medical *personnel* cannot be made prisoners of war; but it is not free to move at its own pleasure in the theatre of war. If captured, it may be detained to attend to wounded, and can only return to its army by the route and at the time selected by the military authorities of the captors. While in the hands of the enemy, it must obey his orders. The private property of its members cannot be taken from them.

It is permissible to call upon medical *personnel* or a medical unit (*e.g.* a hospital train) to halt by firing across its line of march, but mobile medical units, *e.g.* field ambulances, hospital barges, hospital trains, cannot be captured, and must be returned just as the *personnel* is released, and, if possible, at the same time. Fixed medical units, on the other hand, *e.g.* hospitals and store depots, are liable to capture.

Convoys of wounded in requisitioned vehicles and in any vehicles not belonging to the medical service may be broken up, and the vehicles taken, provided that arrangements are made for the care of the sick and wounded.

The enemy's sick and wounded must be treated in the same way as those of the national army, but they are prisoners of war.

In retreating from a battle-field, a portion of the medical *personnel* and material must be left behind for the benefit of the wounded.

The belligerent left in possession of a battle-field must take measures to search for the wounded and protect them and the dead from outrage. The dead must be examined before burial or cremation.

The special privileges granted to the medical *personnel* cease if they are made use of to commit acts harmful to the enemy. There is no objection to the *personnel* being armed and making use of arms in self-defence or in defence of the sick and wounded, nor to a medical unit having an armed guard, nor to the arms of the wounded being retained in a medical unit.

The armed guard must have authority in writing. The members of it have the same privileges as regards freedom from being made prisoners as the medical *personnel*.

The misuse or treacherous use of the Red Cross emblem is absolutely forbidden.

Spies.

There is no technical distinction between a spy and a war traitor; both are persons who obtain or endeavour to obtain information with the intention of communicating it to the enemy.

The essence of spying is acting clandestinely or on false pretences; thus a soldier in uniform seeking information for his own army is not a spy, nor is an inhabitant who reports what he sees while engaged on his ordinary work.

A spy or war traitor cannot be punished without trial. It is the duty of soldiers to arrest any suspicious person; but his subsequent disposal can be left to the higher authorities.

Flags of Truce.

A white flag is not a sign of surrender, but merely an indication of a wish to communicate with the enemy. The enemy is not obliged to take notice of it.

Directions for dealing with a party which approaches with a white flag are given in F. S. Regulations, Part I., Chap. V., Section 86; see also p. 59 of this book.

The party may not consist of more than four persons, namely, the envoy, a flag bearer, a trumpeter, drummer, or bugler, and an interpreter, and should not be less than two, one bearing the visible sign, and the other bearing an instrument to attract attention by sound.

The abuse or treacherous use of the white flag, *e.g.* to obtain information, to approach unobserved, to obtain time to retreat, is forbidden.

The envoy and his party are inviolable, unless they commit an act of treachery, when they are liable to trial; but they may be temporarily detained if this is desirable in the interests of military operations. It is, however, unnecessary to cease fire during an action if a white flag is exhibited, or if the party persist in advancing and it is not desired to receive them.

Armistices and Suspensions of Arms.

Armistices and suspensions of arms are arranged under a flag of truce. Any officer in command of a detachment, unable to communicate at once with a superior, may arrange a suspension of arms in order to obtain instructions, to bury the dead, or to collect the wounded. Armistices are more formal conventions which are made in view of peace, and should only be arranged by the highest authority.

The terms of an armistice should be in writing, and in order to avoid misunderstanding the exact time of commencement and termination, and the troops or district to which they apply should be precisely stated.

Inhabitants and Property.

The family honour, the rights, the lives and private property of peaceful inhabitants must be respected.

The services of inhabitants may be requisitioned provided that what is required of them does not involve their taking part in military operations against their own country. They may be called on to repair roads, railways, and bridges, but not to guard them. They cannot be forced to give information or act as guides against their will.*

Pillage and confiscation of private property is absolutely forbidden, the destruction and seizure of property is likewise forbidden unless imperatively demanded by the exigencies of war. Thus it may be necessary, and is lawful, to demolish a house in order to clear a field or fire.

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* Germany and a few other Powers have not agreed to this.

Private property, including cash, may be requisitioned, but only for the needs of the army. Receipts must be given.

Government property becomes temporarily vested in the captor and should be safeguarded.

All the property of municipalities and parishes and institutions dedicated to religion, charity, education, arts, and sciences, even when Government property, must be treated as private property. All seizure, wilful destruction, or damage of such property, as well as of historic monuments, works of art and science, is forbidden.

Rights and Duties of Neutrals.

Troops driven over the frontier of a neutral State must be interned by that State, when for all practical purposes they are treated as prisoners of war.

If these troops bring prisoners of war with them these prisoners must be liberated.

Subjects of neutral powers resident in a theatre of war are in exactly the same position as other inhabitants ; they are liable to requisitions and contributions, and must abstain from al hostile acts. The belligerent, in whose territory they reside may call upon them to render service in matters of police or civil administration, and such service does not injure their neutrality.

PART II.

PROTECTION.

Means of Protection.

Every commander is responsible for the protection of his command against surprise.

A force requires protection both on the march and at rest. This is provided in the first case by advanced, flank, and rear guards, and in the second by outposts.

In addition to this, Protective Cavalry will, at all events in the initial stages of a campaign, cover the advance of the main columns.

METHODS OF PROTECTION.

The safeguarding of a force is assured :—

Firstly : By an effective system of protective reconnaissance for the purpose of gaining information for its own immediate protection.

Secondly : By detailing bodies to form a protective screen.

Thirdly : By preventing the enemy's scouts or patrols from penetrating its lines, and gaining information.

1.—*Protective Reconnaissance for Immediate Protection.*

To organise effectually the protection of a force, whether on the march or at rest, it is necessary to have information as to the enemy and his movements within a certain definite range of the advanced, flank, or rear guards, or of the outposts. The information may be positive to the effect that the enemy is in force in a certain direction, say, one mile ahead of the van guard, or negative, to the effect that no enemy is to be seen within, say, four miles of the flank guard.

In the absence of early and accurate information of the enemy, the commander of either the advanced, flank, or rear guards, or of the outposts will be working entirely in the dark, and will be unable to take the necessary precautions for the protection of the main body.

2.—*Forming a Protective Screen.*

Until the opposing infantry columns get at all events within striking distance of each other, the first line of security will be the Protective Cavalry. Its duty will be to cover the advance of the army or group of divisions to which it is attached, to prevent the enemy obtaining information as to the disposition of the force which it is covering, and to allow the force tactical freedom of action, and, at a later stage, when the enemy is within striking distance, to reconnoitre thoroughly both his front and flanks and to drive back the troops who cover his advance.

For further particulars as to the duties of the Protective Cavalry, see pp. 151, 155, 156.

If information has been gained as to the presence of the enemy in the immediate vicinity of the main body, or if no information has been gained and the enemy is suddenly encountered, it is the duty of that portion of the force entrusted with the protection of the main body, according to the position which that portion occupies in the system and to the circumstances of the case, either to :—

(*a*) Press back small bodies of the enemy ;

(*b*) Ward off attacks until the main body has had time to assume a formation for offensive action or take up a defensive position ; or

(*c*) Delay the enemy's advance ; and generally

(*d*) Prevent the main body from being surprised.

3.—*Preventing the Enemy's Scouts Penetrating the Lines.*

Since it is the constant aim of the enemy to ascertain by the aid of scouts and patrols the disposition of his opponent's army, so must it be the constant aim of all men engaged on protection duty to prevent him getting any useful information.

It is impossible to over-estimate the importance to a General of being able to move a large force so that the movement is to a great extent unknown to the enemy.

ADVANCED AND VAN GUARDS.

Strategical Advanced Guard.

If it is advisable to strengthen the first line of protection in order, for instance, to cover the advance of one or more columns through a difficult country, it is laid down that a strategic advanced guard may be formed by attaching one or more mounted brigades to a division or by a mounted brigade being itself strengthened by the addition of artillery and infantry. The duties which it is to carry out will be specified by the officer who orders its formation.

Duties of a Tactical Advanced Guard to an Advancing Force.

The main duties of a tactical advanced guard on the march, according to "Field Service Regulations," are :—

(1) To prevent the column being surprised ;

(2) If the enemy is small in numbers, to press him back, thus avoiding the necessity of the march of the column being interrupted ;

(3) If the enemy is met with in force to give the commander of the main body as early information as possible on which to base his plans and put them into execution.

(4) If the commander of the main body has decided on defensive action, to secure any tactical points which may assist the development of the attack by the main body.

(5) If the commander wishes to avoid being drawn into a decisive engagement, to use all available means, short of committing the main body, to delay and hamper the enemy and to discover his dispositions.

It is laid down that if the advanced guard commander is in any doubt as to the intentions of the commander of the force, he must act on his own initiative. If he at once drives in the enemy's advanced troops, he will usually assist the commander of the force in coming to a decision. This will rarely interfere with that officer's liberty of action, but hesitation and delay may do so by allowing the enemy to seize the initiative.

Special Duty of an Advanced Guard to a Retreating Force.

The advanced guard to a retreating force should be small in numbers, unless it is possible for the enemy to interrupt the retreat. Its special duty is to clear away all obstacles which would delay the march of the main body, but it must observe all precautions to guard against surprise, and mounted men should be attached for reconnoitring purposes.

Strength and Distance Ahead of Main Body.

The usual strength of the advanced guard to an advancing force will be from one-eighth to a quarter of the whole force. To a retreating force it will usually be very much smaller.

The distance which the advanced guard must keep in front of the main body will vary greatly according to circumstances, such as the nature of the country, the military situation, and the size of the force. It will usually be, at least, some 3,500 yards ahead in order to secure the main body from coming under effective artillery fire, but with a large force it may be considerably more. The advanced guard should at all events be sufficiently far ahead to give the main body freedom of action in the event of the enemy being discovered in force and to admit of minor opposition being brushed aside without checking the main column.

Orders to Advanced Guard.

The commander of the advanced guard will receive instructions as to his action if the enemy is met, and on receipt of these he will issue his own orders.

For form of orders to advanced guard, see p. 384.

Formation of Advanced Guard.

The advanced guard of a mixed force *may* be in the formation shown in Diagram 1, p. 13.

Extent of Front to be Covered.

The extent of front to be covered by the advanced guard must be determined by :—

(1) The nature of the country ;
(2) Whether there are other columns moving on parallel routes;
(3) The military situation ; and
(4) The size of the main body.

Unless the column is protected by columns moving along parallel routes or by natural features, the extent of front covered should be seldom less than four to five miles on both sides of the track which will be taken by the main body. That is to say, the front covered, at least by patrols, should be from eight to ten miles. In the case, however, of a small body of infantry acting alone, this distance will as a rule have to be very materially reduced.

Division of Advanced Guard into Van Guard and Main Guard.

Except when attached to very small forces, the advanced guard will be divided into a van guard and main guard. Primarily the work of the van guard is reconnoitring, while that of the main guard is fighting.

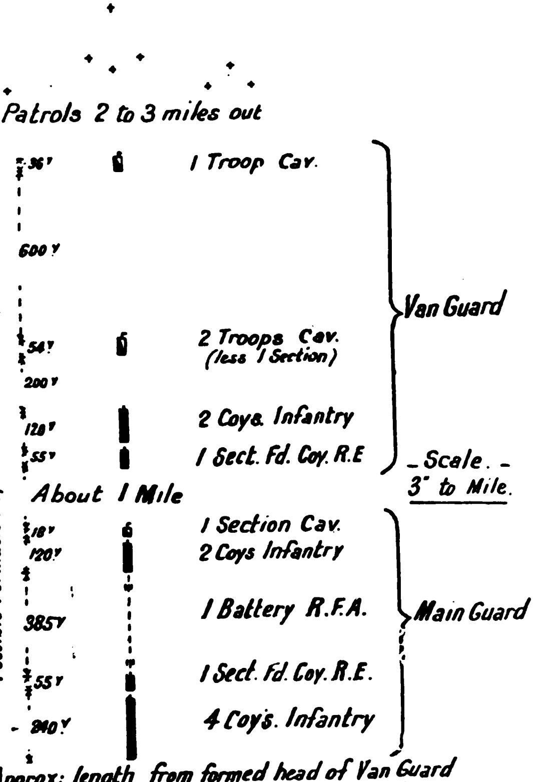

Patrols 2 to 3 miles out
36y
1 Troop Cav.
600y
54y
2 Troops Cav. (less 1 Section)
200y
2 Coys. Infantry
120y
55y
1 Sect. Fd. Coy. R.E
Van Guard
-Scale.-
3" to Mile.
About 1 Mile
18y
1 Section Cav.
120y
2 Coys Infantry
385y
1 Battery R.F.A.
Main Guard
55y
1 Sect. Fd. Coy. R.E.
240y
4 Coys. Infantry

DIAGRAM 1.

Possible Formation of Advanced Guard of a Mixed Force.

Approx: length from formed head of Van Guard (including 1st Line Transport) about 2 Miles.

Van Guard.

Composition.

The van guard will usually consist of the mounted troops of the advanced guard, sometimes with infantry in support. If the country is open and the advanced guard strong in mounted troops, infantry will not usually be attached. Engineers, where required, will also accompany it.

Formation of the Van Guard.

The formation adopted by the van guard will depend on whether there are other columns moving along parallel routes, the nature of the country, the military situation, and the number of men available.

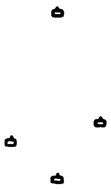
It can broadly be stated that there are two methods of forming the van guard: one is to send reconnoitring patrols to the front and flanks; and the other is to extend groups or bodies on either side of the track to be taken by the main column—roughly speaking, at right angles to it. If in an enclosed country they should move by roads or tracks. In the event of attack, a line of groups or small bodies is in itself of little strength, and though patrols are also open to this disadvantage, they do not entail the employment of so large a number of men and horses. Patrols are therefore on the whole usually preferable, the remainder of the troops forming the van guard being so disposed as best to render support to the patrols wherever required.

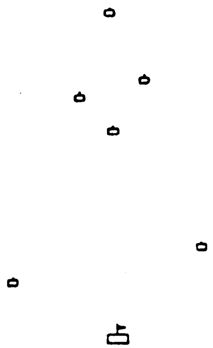
In the case of Infantry acting alone, the regimental scouts may take the place of the mounted patrols.

1.—*In Reconnoitring Patrols.*

If the first method is adopted, either alone or in conjunction with the second, the reconnoitring patrols sent out should ascertain if there is any enemy which can surprise the main guard of the advanced guard. These patrols should, at all events in open country, seldom be less than four or five miles in advance of the main body, so that if possible the main body should never be allowed to get within range even of light, and certainly not of heavy, artillery, unless it has been discovered and reported by these patrols.

The safest formation for these patrols to adopt, if it is a small patrol, is this :— if it is a large patrol, is this :—





Where a small body of infantry is acting alone, the patrols or scouts will usually be from one to two miles ahead of the main body, according to the nature of the country.

General Duties of Each Patrol.

A non-commissioned officer in command of one of these reconnoitring patrols should ascertain :—

(1) On what points information is specially required ;
(2) The area of ground that he is expected to cover ;
(3) The general line to be taken by the patrol on either of his flanks ;
(4) Any definite information known as to the enemy's whereabouts ;

(5) The point where the force will be encamped at the end of the march;

(6) The place where reports are to be sent.

He must search all ground within that area, and, in order to do this quickly, may split his patrol into two groups, should there be sufficient men, and should he think it best under all the circumstances.

Scouting Duties in Certain Cases.

Should there be no body of cavalry or independent scouts in advance of the van guard, the duty of searching for the enemy will be entrusted to the reconnoitring patrols.

In this case, should there be sufficient men, it will often be found best to detach say two scouts from the patrol so that they may work the ground some way in advance of the patrol.

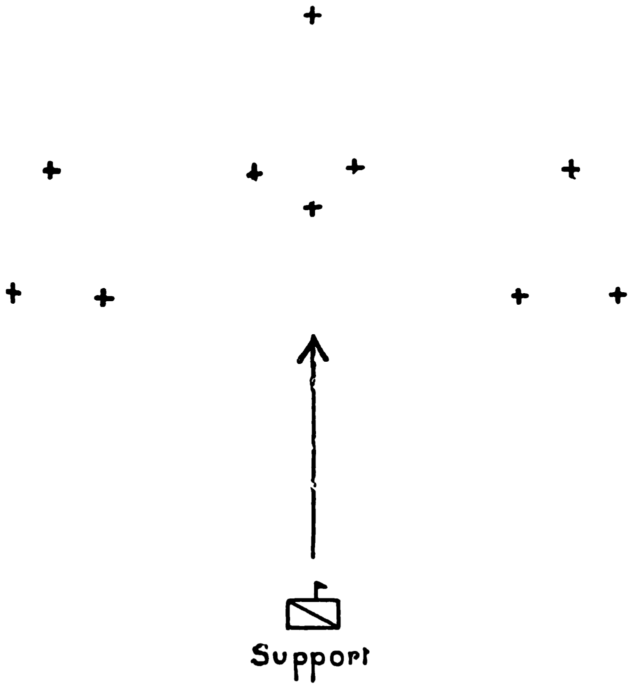
2.—*In Extended Groups or Larger Bodies.*

Another formation for the whole or a portion of the van guard to adopt is for groups or bodies to be extended on either side of the road or track to be taken by the main column, and roughly at right angles to it. Whether the force is to be in groups or larger bodies will depend upon the nature of the country, the number of men available, and the military situation.

The general formation of the van guard may be that shown in Diagram 2, p. 17, though the groups or bodies will obviously extend over a greater front than it is possible to show in that diagram. The extent of front which they will be required to cover must depend on the size of the main body, the nature of the country through which they will be moving, and on the number of available mounted troops detailed for the work. The interval between groups or larger bodies must vary according to circumstances, such as nature of ground, number of men available, and the military situation; but in the case of groups it will usually range from 50 to 300 yards. The groups must obviously be close enough to prevent any body passing between

DIAGRAM 2.

GENERAL FORMATION OF VAN GUARD.



them. Leaders should never fail to keep a close touch with the sections on their immediate right and left.

Other Duties of the Van Guard.

Position of Other Mounted Troops in Van Guard.

If the van guard is strong in mounted troops, the whole of the mounted troops will not be sent on reconnoitring patrols, or even extended; but will be so placed in troops or squadrons as best to render support at the points required should necessity arise.

Infantry Supporting Mounted Troops.

If the mounted troops are unable to advance, the infantry will move forward in support of them. If the van guard cannot even then make progress, the infantry may hold the enemy in front while the mounted troops endeavour to make him vacate his position by outflanking him.

Communication between Van Guard and Other Columns.

Should other columns be moving by parallel routes or should protective cavalry be moving in advance, the van guard must keep up communication with them. The method of doing this is set forth under the head of "Despatch Riding," pp. 137–140.

Precautions against Hostile Scouts and Patrols.

One of the chief duties of the van guard is to prevent the enemy's scouts or patrols from penetrating the van guard's lines, and thereby gaining information.

In order to accomplish this, an officer or non-commissioned officer should think out the line which he himself would take if he were trying to get information; the hollows, watercourses, woods which he would follow, and then watch those places especially. He should remember that it is generally owing to the enemy's lack of vigilance that a scout is enabled to creep close up to a post and obtain information, and he should therefore take care that none of the enemy's scouts are able to profit by a similar lack of vigilance on his part.

Main Guard.

Composition and Duties.

The main guard will usually be composed largely of infantry, as well as artillery and engineers, while, possibly, some mounted troops, who are not detailed with the van guard, may be added.

As previously stated, the chief duty of the main guard is fighting, and it is by fighting that it carries out the objects for which the advanced guard is detailed.

Troops with the main guard must at all times be ready to support the van guard where most required.

For Advanced Guard in Frontier Warfare, see p. 284.

FLANK GUARD.

Main Duties.

The main duties of a flank guard are :—

(1) To prevent the column being surprised on either flank ;

(2) If attacked by a small force, to prevent the march of the main body being interrupted ;

(3) If attacked in force, to hold the enemy at bay until the main body has had time to assume a formation for offensive action or take up a defensive position.

Composition and Strength.

The flank guard will usually consist of mounted troops and infantry ; the mounted troops being employed on the outer flank of the infantry. When the force is a large one artillery may also be employed, especially if the danger of a flank attack is imminent and if the country is suitable for their movement.

The flank guard will generally be detailed from the main body. Its strength will usually depend on whether other columns are marching by parallel routes and whether the column is likely to be attacked in flank.

At Beginning and End of a March.

At the beginning of a march the mounted troops detailed for the flank guard should move out to the position held by the outposts, and ascertain what information they have of the enemy's movements. After doing this, the mounted troops should push on to a suitable point beyond the outposts, where they can safeguard the main body when it moves off. They should then march off in whatever formation may have been decided on, as explained on pp. 20–25.

The flank guard should throughout maintain touch with the advanced guard. It is the duty of the rear guard to maintain touch with the flank guard.

At the end of the march the flank guard should not come into camp, but should remain out until the outposts on that flank have taken up their position.

If these precautions are carried out, the flank will be continually guarded.

Halts on the March.

When the main body halts, the flank guard, unless otherwise ordered, halts also.

During any considerable halt, when the enemy is not reported to be within striking distance, observation posts may be established at favourable points, so that the troops may get some rest.

Formation of Mounted Troops of Flank Guard.

The formation adopted by the mounted troops of the flank guard will depend on circumstances, such as the nature of the country, the number of men available, and whether or not there are other columns moving by parallel routes.

One method is to send out patrols on the flanks, as indicated in the case of the van guard, while another plan is for groups or bodies to move parallel to the line of march of the main body, as shown in Diagram 3, p. 24.

In the event of attack, a line of groups or small bodies is in itself of little strength, and though patrols are also open to this disadvantage they do not entail the employment of so large a number of men and horses. Patrols are therefore on the whole usually preferable, the remainder of the troops forming the flank guard being so disposed as best to render support to the patrols wherever required.

1.—*In Patrols.*

If the first method is adopted, either alone or in conjunction with the second, the reconnoitring patrols sent to the flanks should ascertain if there are any signs of an enemy who is in a position to surprise the main body. In order that artillery may never get within range of the main body without being discovered, these patrols should usually be four to five miles on the flank of the main body.

The same formation should be adopted for these patrols as in the case of patrols of the van guard (see p. 15).

Duties of a Non-Commissioned Officer on a Flanking Patrol.

A non-commissioned officer in command of one of these reconnoitring patrols should ascertain the general line to be taken by the other patrols and the ground that he is expected to cover, so that he may search all heights, particularly within that area, from which it is possible that the main body may be shelled. Moreover, he should ascertain whether, after occupying any heights without opposition, he should leave them to another patrol in rear of him to keep under observation, or whether he is to continue to hold them until the whole of the main body has passed out of range. If he is to hold them, he will usually join the rear guard of the column as soon as it has passed his position. The non-commissioned officer of the leading patrol or group must ascertain the position of the groups or patrol of the advanced guard immediately in front, and keep in touch with them, so that none of the ground may be left unsearched and no opportunity given to the enemy to slip in between them. In the same way, no ground between two flanking patrols should be left unsearched, nor any opportunity given to the enemy to slip in unnoticed between two patrols and attack the main body.

Since a ridge or other natural feature is just the ground where the enemy may mask artillery or hide a body of men, the non-commissioned officer must make a point of searching any likely places of this sort immediately beyond the general line taken by the flanking patrols.

Before advancing to occupy any height, both the height itself and any intervening ground coming into view should always be scanned with glasses by the non-commissioned officer to see if there is any sign of the enemy. In addition to this, it is usually best to have a scout out in front of the patrol.

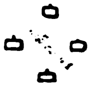
2.—*In Extended Groups or Larger Bodies.*

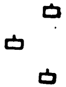
Another formation for the mounted troops of the flank guard to adopt, either alone or in conjunction with the first formation, is for groups or larger bodies to be aligned along the flanks of the main body at a considerable distance from each other and to move forward parallel to the main body. Whether the mounted troops are in groups or larger bodies depends upon the nature of the country, the number of men available, and the military situation.

The distance of these parties from the main body must depend on the size of the force, nature of the ground, and the military situation, but a distance of from 1,000 to 2,000 yards will usually be enough, though it must, in any event, be sufficient to allow the main body freedom of action in case the enemy is encountered in force. Some patrols should always be detailed for the immediate protection of the flank guard.

Formation for Each Group.

When in groups, as in the case of a very small force, the safest formation for each group of four individuals to adopt is :— or for three individuals :—





Formation of Extended Groups or Bodies.

In order to avoid covering the same ground twice it will be better, particularly in hilly, wooded, or enclosed country, for each party not to follow exactly the party in front of it, but to diverge a little one way or the other.

The flank guard may be more or less in the formation shown in Diagram 3, p. 24.

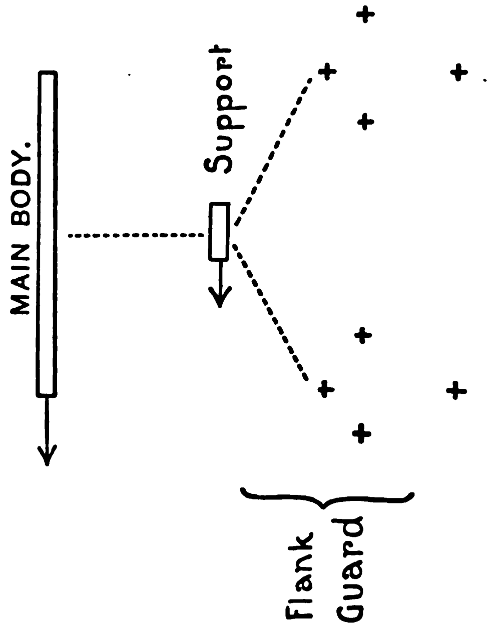
Since it is necessary to keep the general line of protecting parties parallel to the route taken by the main body, leaders should be careful not to get too far out of the general line. Moreover, it is imperative that no leader should ever lose touch with the party immediately in front of him. The exact interval between the parties must depend on the nature of the ground, the military situation, and the number of men available. Should the country be close, or should an attack be expected, the interval will of course be less than in an open country, or if no attack is expected.

Formation of Infantry.

If a body of infantry is acting independently, it may adopt a formation somewhat as shown in Diagram 3, but if mounted troops form part of the flank guard, the infantry, except perhaps in hilly country, will usually act only as supports to the mounted troops.

DIAGRAM 3.

GENERAL FORMATION OF FLANK GUARD.


MAIN BODY.
Support
Flank Guard

In an enclosed country, the infantry will move of course by some roads which are generally parallel to that taken by the main body.

For Flank Guard in Frontier Warfare, see p. 284.

REAR GUARD.

Main Duties.

The main duties of the rear guard are :—

In the case of a defeated force :—

(1) To relieve the column from the pressure of pursuit by impeding the enemy's advance, and gaining time for the column to retreat ;

In the case of an advancing force :—

(2) To prevent the enemy surprising the column from the rear;
(3) To protect from capture any of the column falling behind.

Strength and Distance from Main Body.

The distance which the rear guard should keep from the main body must depend on circumstances, such as whether the force is retreating or advancing, the nature of the country, and the number of men available. If there is no considerable distance between the main body, the second line transport, and transport and supply columns, one rear guard will be sufficient, otherwise the rear guard will follow the main body, and the transport will be separately protected.

In the case of a retreating force, or even of an advancing force when there is danger of its being attacked in rear, the distance should be at least sufficiently great to enable the rear guard to prevent the enemy shelling the main body. The exact distance must depend upon the nature of the country. While observing these precautions, the rear guard should not however place itself in such a position that the enemy could get in between it and the main body.

The rear guard to a retreating force will vary in strength from one-fifth to one-third of the whole force, and will be formed of the three arms, lightly equipped, with a very large proportion of artillery. A detachment of R.E. provided with demolition equipment should usually accompany the rear guard.

In the case of an advancing force, where there is no danger of its being attacked from the rear except by marauders or snipers, and where the only duty is to pick up stragglers, the distance may safely be very much less than in the case of a retreating force, and may vary from 1,000 to 1,500 yards. In this case the strength will be very small, varying perhaps from a platoon to one or two companies of infantry for a force of the size of a division, with some mounted troops to watch the flanks.

Instructions to Rear Guard Commander.

It is laid down that the rear guard commander should receive instructions on the following points:—

(1) The approximate distance to be maintained between the rear guard and the main body;

(2) How far the enemy is to be opposed, in order to maintain that distance;

(3) To what extent he is at liberty to break down bridges, burn villages and destroy railways with a view to impeding the enemy's advance.

On receipt of his instructions he will issue his orders.

Orders to Rear Guard.

For form of orders to rear guard, see p. 387.

Extent of Rear to be Covered by Rear Guard.

In the case of a retreating force, or of an advancing force where there is danger of its being attacked, the extent of rear to be covered must be determined by the nature of the ground along which an attack or effective pursuit could be launched against the main body. It must at least be wide enough to prevent the enemy seizing any positions from which he could shell the main body.

In the case of an advancing force, when there is no danger of its being attacked by any but snipers, 1,500 to 3,000 yards, according to the nature of the country, will usually be a sufficient extent of rear for the rear guard to cover.

At the Beginning and End of March.

If the force is retreating and is being pressed by the enemy, special steps will be taken, both at the beginning and end of a march, to hold a strong defensive position. Before beginning the day's march, and if the enemy is not pressing, a portion of the rear guard, including all the mounted troops, will fall back on the line of outposts, and obtain from them any information as to the enemy's movements. They should then take up the position held by the outposts or, if it appears advisable, a position further to the rear, holding it until the whole of the main body has retired to a safe distance.

At the end of a march, the rear guard will halt when the main body halts, and hold a defensive position until relieved by the outposts.

Halts During the March.

During a halt on the march, if the enemy is pressing or there is any likelihood of immediate attack, the rear and flanking parties should at once take up a defensive position, choosing, where possible, some ridge, river, or other natural feature, while the main guard places itself where it is best able to reinforce any portion of the line which may be in difficulties.

When the enemy is not reported to be within striking distance, observation posts may be established at favourable points during any considerable halt, so that the troops may get some rest.

Division of Rear Guard into Rear Party and Main Guard.

Except in very small forces, the rear guard will be divided into a rear party and a main guard.

Rear Party.

Composition.

The rear party will consist usually of mounted troops, owing to their greater mobility in retiring. Some mounted engineers may also be attached, to demolish bridges, block roads, or carry out any other similar work which would delay the enemy's advance.

Formation of Rear Party.

The usual formation of the rear party is to extend groups or larger bodies on either side of the route taken by the main body, and, roughly speaking, at right angles to it. Whether they are in groups or larger bodies depends upon the number of men available, the nature of the country, and the military situation. If in an enclosed country they should move by roads or tracks.

When in formation of extended groups or larger bodies the general line of the rear party will be that shown in Diagram 4, p. 29.

The parties will obviously extend over a greater front than it is possible to show in this diagram. The interval between the groups or larger bodies must again depend upon circumstances, such as the nature of the ground, the military situation, and the number of men available, but must obviously be close enough to prevent any body of the enemy passing between them. When the pursuit is pressed, the groups may be either strengthened or in an open country drawn closer so as to allow a larger number of men being placed in the firing line.

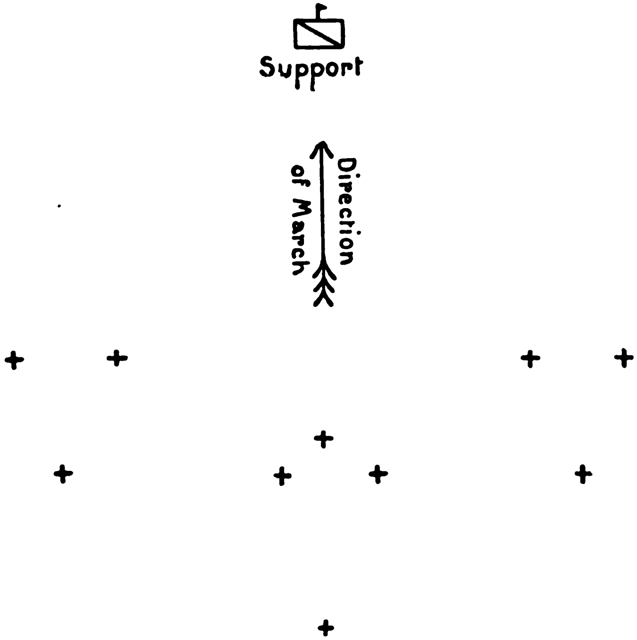
Flanking Parties.

Composition and Formation.

The flanking parties of the rear guard will consist of mounted troops whenever available. When the pursuit is pressed, artillery may also be attached with a strong escort. The formation for flanking parties to adopt must depend on the nature of the ground and the number of men available. It

DIAGRAM 4.

GENERAL FORMATION OF REAR PARTY


Support
Direction of March

will often be found best to have a series of groups or parties covering the flank as much as possible at all tactical points, and somewhat in the formation shown in Diagram 3 on p. 24.

General Duties of Flanking Party.

The principal duties of the flanking parties will be :—

(1) To prevent the flank of the rear guard being turned ;
(2) To prevent the enemy interposing himself between the rear guard and the main body ; and
(3) To co-operate with any artillery, which may have been posted wide on the flanks, in any offensive movement undertaken to delay the enemy's advance.

1.—*Guarding the Flank of Rear Guard.*

Whenever either flank of the rear guard is not resting on some naturally strong position, great care must be taken that it is not turned by the enemy, thus forcing the rear guard prematurely to vacate its position. When facing the enemy it will often be best for this reason to occupy some important point slightly to the flank of the rear guard, such as a bridge, ford, or hill commanding a valley.

If scouts or small patrols are sent out wide on the flanks, they can give timely warning of any attempt on the enemy's part to turn the flank.

2.—*Preventing the Enemy Interposing himself.*

Inasmuch as the distance between the rear guard and the main body constantly varies, considerable difficulty will be found in preventing the enemy interposing himself between them. At one time not only may the distance between the two bodies be comparatively small, but there may be very few avenues by which the enemy could approach, whereas at another time the distance may be considerable, with several avenues of approach.

A commander of a flanking party must bear in mind the great importance of preventing the enemy driving the force right in, before the rear guard has retired sufficiently to prevent its flank being exposed to any immediate attack. Should it not be possible for him to hold his own against the enemy, the rear guard must of course be at once informed and if necessary asked for support.

3.—*Co-operation with Artillery on the Flank.*

When guns are posted wide on the flanks of a rear guard position, a strong mounted escort will usually be detailed to protect them. The duties of such an escort are set out on pp. 250–252.

The other mounted troops should actively co-operate with the artillery in preventing turning movements, and in forcing the enemy to deploy as far off as possible when advancing against each successive rear guard position. Although the mounted troops should not allow themselves to get detached too far from the rear guard, thereby risking the security of the rear party's flank, they should watch for any favourable opportunities for taking offensive action against any bodies of the enemy who may press too far forward in the pursuit.

Main Guard.

Composition and Formation.

The main guard will usually consist of mounted troops, artillery, and infantry, the two former being particularly strong —the mounted troops because of their ability to withdraw quickly from a rear guard position, and the artillery because of their power to make the enemy deploy at some considerable distance from any rear guard position. When the pursuit is not pressed, the main guard will move in the order in which they can most readily come into action.

Any officer in command of troops forming part of the main guard must be ready at any moment to reinforce the firing line on either of the flanking parties which may be in danger of being driven in.

For Rear Guard in Frontier Warfare, see p. 285.

Principles of Rear Guard Fighting.

Essentials of Rear Guard Positions.

The choice of a rear guard position should be influenced by the following considerations :—

(1) Whether it will lend itself to at least temporary defence ;
(2) Whether it is one from which it would be easy to withdraw without exposing the men to a heavy fire.

Unless there are tactical reasons to the contrary, the positions successively occupied by the rear guard should be so far apart as probably to induce the enemy to re-form column of route after seizing one position and before or while advancing against another.

Any officer sent forward to select rear guard positions should carefully bear these requirements in mind, noting at the same time any smaller intermediate positions, which could be held by portions of the rear party as the other portions retire.

General Tactics of Rear Guards.

The two main principles of rear guard fighting are, firstly, to make as great a display of force as possible by putting the greater part of the force into the firing line at the outset and secondly, to make sure of good lines of retreat. The rear guard should endeavour to compel the enemy, after he has advanced some distance in column of route, to deploy at as great a distance as possible from each of the successive rear guard positions, so as to delay him and gain time, which is all-important.

In order therefore to bring this about, fire should be opened at long ranges and a great display of force made from the outset. For this reason the greater portion of the force should be put into the firing line, a small portion only being kept in reserve.

If the position to be next occupied by the rear guard is at some considerable distance from the first, the enemy will probably be forced to re-form column of route, and then to deploy again to attack the new position. All these movements require time, and time is what is required by a defeated or retreating force.

Retirements from Rear Guard Positions.

It is very important to judge accurately the moment to retire. To retire too soon is only partially to carry out the work of the rear guard. To retire too late may mean that the rear guard becomes seriously involved, and possibly cut off from the main body, or that the progress of the main body is greatly delayed through having to extricate the rear guard.

In order that the enemy may not know that a retirement is taking place, a steady fire should be kept up till the last men leave. In the case of a mounted force, squadrons or troops should fall back one at a time, but in smaller bodies the men should as a rule creep away one section at a time, leaving a non-commissioned officer with one section of the troop to cover their retirement by keeping up a rapid fire until the remainder are mounted. When the remainder of the men have mounted and fallen back to a position where they can cover the retreat of the last section, that section should mount and retire rapidly. In retiring they must be careful not to mask the fire of the covering party. The whole troop will thus fall back, galloping from one covering point to another, until they eventually reach the next position which the commander of the rear guard intends to hold. In retiring by troops, an officer should be careful not to let his line of retreat converge with that of another troop.

The same tactics apply to infantry when they are acting alone: companies, platoons or sections should fall back one at a time. In very small bodies, the men should as a rule creep away a squad at a time, leaving a non-commissioned officer with one squad to cover their retirement.

Where infantry is acting in conjunction with mounted troops, the infantry will of course fall back first, leaving the mounted troops to cover its retreat. But even in this case, the infantry will usually fall back by companies or platoons so as not to withdraw too large a body of men from the firing line at one time.

MEANS OF DELAYING ENEMY'S ADVANCE.

By Demolitions.

The enemy's advance may be greatly delayed by the destruction of railways or bridges, or by the burning of villages, but these steps must not be resorted to without the authority of the officer commanding the rear guard, because the retreat may be only temporary, and the force may again occupy the country.

As to method of destroying railways and bridges, see " Demolitions " in Field Engineering, pp. 678–699.

The following steps can, however, be taken without special orders :—

(1) Narrow roads and tracks can be blocked. This may be done, for instance, by locking together several wagons, and by removing one or more of the wheels ; by blowing down large trees across the tracks, or by laying across the road abattis of felled trees with the branches laid towards the enemy.

For method of blowing down trees over and under 12 *inches diameter, see p.* 706.

For method of forming abattis of felled trees, see p. 732, *and Plate* 86, *p.* 735.

(2) Fords can be rendered impassable by the throwing in of ploughs, harrows, etc., upside down, or, if time allows, by wiring the fords. *For methods of wiring fords, see p.* 713.

(3) Boats and rafts can be moved to the side of the river furthest from the enemy, and either burnt or sunk, sinking being usually quicker.

(4) Blocks of houses, villages, woods, heather, dry grass or scrub can be set on fire. Their smoke will also help to hide the movements of the rear guard. If the wind is blowing towards the enemy, a successful fire greatly impedes his movements. But, when the wind is blowing towards the retiring rear guard, no fire should be started until the rear guard is clear of the inflammable material.

By Ambushes.

An ambush may be laid in any favourable ground, for instance, a defile between two hills. If such an ambush is laid by mounted troops, some of the men should be dismounted, while others should be kept in reserve to charge the enemy in the event of his being thrown into confusion by fire from the dismounted men.

The closer the enemy is allowed to get before opening fire the better, provided that he does not come close enough to discover the ambush.

A safe avenue of retreat should invariably be kept open in the event of the failure of the ambush. The display of a considerable body of men, apparently hurriedly retiring, may possibly assist in leading the enemy into the trap.

Beyond the immediate loss in men to the enemy, one probable result of a successful ambush will be to make him move with greater caution and consequently more slowly. Delay means time, and time is what is required.

Other Means of Surprising Pursuers.

In addition to carefully laid ambushes, other opportunities should be taken of inflicting loss upon any detachment of the enemy which may press too close. For instance, in order to give him an idea that all the rear party has retired, a good plan is to cease firing for some time, and then, if a detachment has been drawn into pressing too near, to pour a hot fire into it at close quarters.

OUTPOSTS.

Main Duties of Outposts.

Every force when halted should be protected by outposts, in order that it may rest undisturbed.

The duties of outposts are twofold: first, always to watch so that the main body is not surprised, and to that end always to keep the enemy under observation once touch has been gained, so that no movement passes unnoticed ; secondly, should an attack be made, to gain time for the commander of the force to put his plan of action into execution. If an attack is made, the outpost line must be held until the main body has had time to occupy defensive positions. The enemy's artillery must be prevented at all hazards from occupying any positions which may command the camp.

Different Kinds of Outposts.

Outposts are either :—

(1) Mixed outposts, composed of outpost mounted troops, outpost companies and possibly a reserve ; or

(2) Cavalry outposts, which would only be used when the whole force is a mounted one, as in the case of cavalry acting independently ; or

(3) Infantry outposts, which would be used when the force consists mostly of infantry, or when the positions could be more suitably occupied by infantry. If available, a few mounted troops would be attached merely for reconnaissance and orderly duties.

Machine guns will be included with the units forming the outposts.

General Formation of Outposts.

A complete outpost line consists of :—

(1) Reconnoitring patrols, which are told off to search the country within a few miles of the outpost line to ascertain if it is clear of the enemy, and, if it is not clear, to locate him and safeguard the outposts against surprise;

(2) Vedettes or cossack posts, or in the case of infantry, sentries or sentry groups, which usually form the most outlying portion of the actual outpost line ;

(3) Visiting patrols (detailed from the piquets), whose duty is to visit the vedettes and cossack posts, or, in the case of infantry, the sentries or sentry groups, and

patrol any unseen ground lying between those vedettes or posts, as well as to maintain touch with the piquets on either flank ;

(4) Piquets, which supply the vedettes, cossack posts, or, in the case of infantry, the sentries or sentry groups, visiting patrols, and, on many occasions, the reconnoitring patrols ;

(5) Supports, from which the more outlying portions of the line would be reinforced, if required. Visiting patrols may be detached from the supports to maintain touch with the piquets, and also with the supports on either flank, as well as with the reserve. Reconnoitring patrols may also be detailed from the supports instead of, or in addition to, those detailed from the piquets ;

(6) A Reserve, which is held in readiness to reinforce any portion of the line.

Whether the whole or only a portion of this outpost line will be employed must depend on :—

(1) The size of the force itself ;
(2) The circumstances under which the main body is encamped ; and
(3) The proximity and strength of the enemy.

A small force, for instance, will not have a reserve, and perhaps not even supports. Again, the outposts of a besieging or beleaguered army will be in far greater strength than a force encamped merely for the night during a march.

In the case of protective cavalry scattered over a wide extent of front in comparatively small bodies, each small body will form its own outpost line at the place where it is bivouacked.

Duties of Mounted Troops on Outposts.

Economy must always be exercised in the use of mounted troops for outpost duties. In the case of mixed outposts, they will usually be employed, either in :—

(1) Forming observation posts in front of the main outpost position; or
(2) Furnishing reconnoitring patrols, and doing other reconnoitring work, when attached to a section of the outpost line; or on occasions
(3) Holding a portion of the main outpost line.

Artillery with Outposts.

It is laid down in "Field Service Regulations" that artillery may be useful with outposts:—

(1) When the outposts occupy the ground which the main body is to hold in case of attack;
(2) If there is limited ground over which the enemy has to pass when approaching the outposts;
(3) When it is important to prevent the enemy from occupying artillery positions within close field artillery range of the outposts.

It is stated, however, that in no case, except when the outposts occupy the battle position, should more guns be employed than can be easily and rapidly withdrawn. At night, they must be withdrawn, unless they are with the reserve.

Machine Guns.

It is further laid down that machine guns may be usefully employed to sweep approaches, and to cover points which the enemy, in advancing, is likely to pass or to occupy.

It is usual to add machine guns to the outposts.

Strength of Outposts.

The rules laid down in "Field Service Regulations" as regards strength of the outposts are:—

Since outpost duty is most exhausting, not a man or horse more than is absolutely necessary should be employed. The duty of observation must never be relaxed, whatever the distance of the enemy. The number of troops detailed for resistance will depend on the ground, the distance from the enemy, and the tactical situation.

Position of Outposts.

It is now laid down that when there is any possibility of a force coming into conflict with the enemy, its commander should, when halting for the night, first decide on his dispositions in case of attack, and then arrange accordingly the quartering of his command and the position of his outposts.

The first essential of an outpost position is facility for protracted defence. Facility for observation is of far less importance, provided that the ground to the front can be well patrolled.

The distance between the outpost position and the main body is regulated, first, by the time the main body will require to prepare for action, which will obviously depend not only on the size of the force, but on whether it is in quarters or in bivouac; and secondly, on the necessity for preventing the enemy's artillery from interfering with the freedom of movement of the main body.

The outposts must, therefore, be able to cover with their fire any ground from which the enemy's artillery could shell the main body—at all events, at effective range—as it moves to take up its position.

In "Field Service Regulations" it is pointed out that command, co-operation, and inter-communication between different sections of the outposts will be facilitated by placing the advanced troops—*i.e.* the piquets and posts—along well defined natural features, such as ridges, streams, or the outer edges of woods, etc., or in the vicinity of roads. But this must not be allowed to outweigh the necessity of making the best tactical disposition possible.

It is important to arrange for quick communication between different parts of the outpost line and the troops in rear.

Sanitary Arrangements.

It is stated that all bodies of troops on outpost duty must observe the rules laid down for the sanitation of camps and bivouacs, though the extent of the arrangements must depend on the time the outpost line is likely to be occupied. Latrines and refuse pits must in any event be dug.

Principles of Outposts in Open and Enclosed Country.

The scheme of reconnaisance and defence which the outposts will adopt in an open country differs from that in an enclosed country, in that in open country not only the roads but the whole line will have to be held, whereas, if the country is enclosed, so much importance need not be attached to the forming of a close cordon round the main body as to the guarding of all roads along which the enemy can approach in strength. But the intervening ground must always be watched by patrols and observation posts.

Holding Roads at Night.

It is also laid down that in civilised warfare outposts at night should seldom be drawn closer to the main body than during the day except for some tactical reason, such as the necessity of holding the junction of roads or paths. Roads must always be held strongly at night in an enclosed country, because the enemy would have great difficulty in advancing in strength except by the roads.

Division of the Front into Sections.

If the outpost line is extensive, the commander of the outposts will divide it into sections with clearly defined boundaries, and allot each section to a group of squadrons or companies, and name the commander of each section. If the front is not extensive, separate sections will be dispensed with, and the front merely divided between outpost squadrons or companies. If divided into sections, the commander of each section, on receiving his orders will subdivide his section between his outpost squadrons or companies, as the case may be, naming some clearly defined boundaries for each.

The Germans so divide sections that any important road lies within the limits of a section, and not between two sections.

Commander of the Outposts and his Orders.

The commander of the force will in his orders detail the outpost troops, and name the commander of the outposts.

For form of orders detailing outpost troops and giving the outpost line, see pp. 390–393.

When the outpost commander receives these orders, he in his turn will issue, either verbally or in writing, such orders to the outpost troops as are immediately necessary for the occupation of the outpost line. He will supplement these by detailed orders.

For form of detailed outpost orders, see p. 390.

Division of Front among the Piquets.

When a definite extent of front has been apportioned to each outpost squadron or company commander, he will march, with scouts out, to the ground which has been allotted to him, and halt under cover. He will send out, in addition to some scouts well in advance, three or more groups, one on either flank, to reconnoitre the proposed position, and to occupy ground beyond it until the piquets have taken up their positions, and the vedettes or sentries have been posted.

The commander will then, after examining the ground, decide on the number and position of his piquets. He will usually send forward two or three piquets, as seems best suited to the nature of the ground. If, for instance, the country is enclosed and there are three roads intersecting the front allotted to his squadron or company, he would certainly send forward three piquets. As a general rule, a small number of strong piquets is to be preferred to a large number of weak ones. He will then decide on the strength and position of the support, which will usually consist of a complete command, namely, a section or a platoon.

The fact that open ground can be more readily defended and patrolled than enclosed ground by day, but not at night, may make it necessary to reinforce piquets at dusk.

After the supports and piquets have been detailed, the commander will select a good defensive position, which should, if possible, correspond with the line of piquets. This position should support and be supported by the squadrons or companies on either flank. He must make sure that no ground on either flank is left unprotected.

Piquets.

Choice of Position for a Piquet.

In choosing the exact position for a line of piquets, and, in fact, for each particular piquet, the three main essentials are that the position should be one which is:—

(1) Difficult to surprise;
(2) Easy to defend;
(3) Easy to retire from.

But if the position of the piquet, though otherwise favourable, renders it liable to be surprised, such a possibility must be guarded against by the posting of additional vedettes or double sentries and the sending out of more frequent patrols.

To choose a position easy to defend is of great importance, particularly if the commander of the outposts has decided to hold the piquet line in the event of attack. But in any case it is practically the primary essential; therefore if no position answers this purpose within the area to which the commander of the piquet is restricted, the position selected must as far as possible be artificially strengthened.

To choose a position from which it is easy to retire is not of so much importance, and must, therefore, not be allowed to affect the decision, more particularly if some other position fulfils to a large extent the two other requirements.

If in addition to the other requirements the position commands an extensive view, so much the better, but this is also not in any way essential, because the lack of an extensive view can be met by throwing out patrols, or by placing an observation post.

If the country is open or an extended view of the outpost line could be obtained by the enemy, any alteration in the position of a piquet or support, which may be necessary for the purpose of defence during the night, though planned before dusk, should not be carried out until dark.

Precautions when approaching a Position for a Piquet.

When approaching a position at which it is intended to post a piquet, it is advisable, in addition to having a scout well in advance, to send forward two groups some way ahead of the piquet, one on either flank, to reconnoitre the proposed position, and to occupy ground beyond it until the piquet has taken up its position and the vedettes or sentries have been posted. When this is done, these groups can be withdrawn, unless, of course, they are needed to form the reconnoitring patrols, which should in any case be sent out directly the piquet is in position.

Similar precautions should of course be taken when supports are moving into position. The protecting troops should temporarily hold a line somewhat in advance of the proposed line of piquets.

Choice between Vedettes and Cossack Posts and between Sentries and Sentry Groups.

Directly the piquets are in position, either vedettes or cossack posts, consisting of three to six men under a N.C.O., or, in the case of infantry, sentries or sentry groups, must be detailed and posted. In deciding which of the two to employ the advantages which cossack posts or sentry groups, consisting of three to six men under a N.C.O., possess over vedettes or sentries as the case may be must be taken into consideration.

Shortly, they are :—

(1) The fact that in cossack posts or sentry groups the sentries gain confidence owing to the reliefs being close at hand. There is, moreover, less chance of their being rushed.

(2) The fact that the reliefs are saved fatigue, and that there is less chance of their being seen when relieving.

(3) The fact that men are always available to take charge of any persons halted by the sentries, as well as to carry messages to the piquet, or possibly to communicate with the posts on either flank.

(4) The fact that at night vedettes or sentries cannot be seen from the piquet, and might therefore be rushed without the knowledge of the piquet.

The main disadvantage of a cossack post as compared with vedettes is that the piquet is weakened, owing to the number of men withdrawn, perhaps to such an extent as to make it practically useless for effective defence.

In deciding between vedettes or sentries and cossack posts or sentry groups the main consideration is whether it is best to keep a strong piquet and incur the risk of the sentries being rushed, or whether to run the risks attendant on a weakened piquet and strengthen the sentries.

If therefore in any particular case it is more important that the piquet should be strong, a great advantage lies in vedettes or sentries; but, if it is more important that the sentries should be strengthened, the advantage lies with cossack posts or sentry groups.

Circumstances must govern each particular case to a large extent, but should the occasion not appear to demand one course more than the other, one of the deciding factors must be the size of the piquet before any men are detailed for cossack posts or vedettes, or in the case of infantry for sentry groups or sentries. If the piquet is a strong one, its extent of front normal, and other conditions favourable, cossack posts or sentry groups may be employed. If the piquet is only of medium strength, one cossack post or sentry group may be employed, and, say, two double vedettes or double sentries, or *vice versa*. If the piquet is weak, vedettes or sentries only should be employed.

But there are occasions on which it is clearly an advantage to employ at one and the same time both cossack posts and vedettes, or sentry groups and sentries, since one portion of the line may be particularly suitable for cossack posts, or in the case of infantry for sentry groups, and another portion for vedettes or sentries.

Position of Vedettes or Cossack Posts, Sentries or Sentry Groups.

The exact positions to be taken up by the vedettes or cossack posts, or sentries or sentry groups, detailed from a piquet, must depend on the lay of the ground and the extent of front which has to be held by the piquet; the general rule being that these should be situated at the best tactical points, whether they be, for instance, on a road, knoll or ford, some 300 to 500 yards ahead of the piquet. The exact distance must depend entirely on the particular circumstances, but it must at all events be sufficient to allow the piquet freedom of action in the event of attack.

When vedettes or posts, or sentries or sentry groups, are being posted, patrols should be pushed forward to cover them.

Necessity of Forming a Plan of Defence.

The first duty of the commander of a piquet is to form a plan of defence in case of being attacked, and to communicate it to the N.C.O.'s and the senior soldiers of the vedettes or posts, or sentries or sentry groups. The commander is held personally responsible that an attack always finds his piquet prepared, and that the troops in rear receive intelligence of the attack in time to take up their positions to resist it.

The commander must, of course, base his plan on the instructions which he has received either from the commander of the outposts or the officer commanding the section of which his piquet forms part.

Procedure when the Line of Piquets is to be the Line of Resistance.

If the orders are that the line of piquets is to form the line of resistance in the event of attack, directions must be given to the vedettes and cossack posts, or sentries and sentry groups, to fall back as slowly as possible, in order to give the piquets time to take up their defensive position. The commander of each piquet must decide from the configuration of the ground whether he can best guard his extent of front by keeping the piquet intact or by splitting it up. The question as to whether the piquet should be maintained intact, or be divided into two parties, must depend on the nature of the ground and on the necessity for holding one particular place. If the country is open, and the whole of the ground can be commanded during daylight from one position, or if it is essential to hold one particular point, it is best to maintain the piquet intact. If, on the other hand, the country is enclosed, or there are, say, two points which it is essential to hold for the security of the remainder of the section, the piquet may be divided; but as a general rule this should never be done, unless the particular circumstances demand it.

It is laid down in " Field Service Regulations " that piquets should only in exceptional cases fall back on positions held by the supports.

Times when an Attack is most to be Expected.

There are two occasions when an attack is most to be expected: firstly, just before dawn, because the enemy has had the opportunity of advancing under cover of the night; and, secondly, at dusk, because if the enemy gains the position at that time, he is able to entrench it after dark.

In order to be prepared for an attack at dawn, the whole of the outposts will stand to their arms for an hour before daybreak, each piquet being in its defensive position, or ready to move into it at a moment's notice. In fact, they must remain under arms until the patrols report the ground in the vicinity to be clear of the enemy.

As an additional precaution, it is laid down that when the outposts are to be relieved in the early morning, the reliefs should parade in time to march off an hour before dawn. The troops who have been relieved will not return to camp until the patrols report all clear.

Immediately on an alarm being given, the piquet should at once step into its prepared position, and the vedettes or sentries, as they fall back, take their places in the firing line.

Piquets in Proximity to Enemy.

In the event of some of the piquets being in close proximity to the enemy, it is laid down that the commanders should refrain from needless attacks on the enemy's piquets, since, at the best, little advantage is gained, whereas if an attack develops in the slightest degree the rest of the whole of the main body may be disturbed. More than that, they may be even committed to a premature engagement.

Passage of Persons through the Outpost Line.

It is laid down that no one other than troops on duty, prisoners, deserters, and flags of truce are to be allowed to pass through the outposts either from within or from without, except with the authority of the commander who details the outposts or of the commander-in-chief. Inhabitants with information are to be blindfolded and detained at the nearest piquet pending instructions, and their information sent to the commander of the outposts.

The commander of the nearest piquet or of the outpost squadron or company is the only person who should hold any conversation with persons presenting themselves at the outpost line, and he should confine the conversation solely to what is essential. The commander of the outposts is the only person who is allowed to interrogate fully any persons who present themselves. Prisoners and deserters should be sent at once under escort to the commander of the outpost squadron or company, who will forward them to the commander of the outposts. If for tactical reasons no piquet is posted on a main line of traffic, a detached post should be specially detailed by the commander of the nearest outpost squadron or company. The officer or N.C.O. in charge of this post will receive special instructions as to the method of dealing with persons wishing to enter or leave the line.

Duties Carried Out by a Piquet.

Every man on the piquet should know :—

(1) The direction of the enemy ;
(2) The position of the neighbouring piquets and of the support ;
(3) What he has to do in case of attack either by day or by night ;
(4) Whether there is any cavalry in front ;
(5) The line of retreat.

The men composing a piquet will be employed in some or perhaps all of the following ways. If the piquet is weak in numbers, or if it is important that it should not be depleted, the duties, more particularly of finding reconnoitring patrols, may be carried out by men specially detailed from the supports or elsewhere.

(1) Sentry over arms ;
(2) Guard over horses ;
(3) Reconnoitring patrols ;
(4) Vedettes or cossack posts, or in the case of infantry, sentries or sentry posts ;
(5) Visiting patrols.

Troops on piquet duty should never lay aside their accoutrements, and only a few men at a time should be allowed to leave the piquet for any purpose. Men when foraging must never be allowed to move about in the sentry line, much less in front of it.

The men retained at the piquet itself, including the various reliefs, should be employed in preparing a defensive position, always, however, being kept in readiness to turn out at a moment's notice. One N.C.O. should be employed in ascertaining the distances of all prominent objects within range.

When guarding a road, the placing of a barricade of any kind on the road will very materially assist in its defence at night, at least from a cavalry attack. If the barricade can be so arranged as not to be seen by the enemy until he is right on the top of it, a very effective fire can be brought to bear when the first men reach it and the others are pressing on them from behind.

A barricade of this nature may be made by placing cut-down trees, as shown in Plate 86, p. 735, or posts, with wire stretched across them, as shown in Plate 84, p. 733, or by carts locked together. A ditch in front of the obstacle, should there be time to dig one, will greatly add to the enemy's confusion at night.

For particulars as to more elaborate precautions for a defensive position, see "Field Engineering," pp. 715–737.

Every endeavour should be made to settle the men down to rest as soon as is consistent with the proper carrying out of their duties.

I.—*Sentry over Arms.*

The commander of the piquet should always mount a sentry at the piquet post to watch for any signals from the vedettes or cossack posts, or in the case of infantry sentries or sentry groups, and to guard the piquet against surprise. A connecting file between the vedettes and the sentry will also be necessary if the vedettes are not visible from the vicinity of the piquet, or it they cannot easily make any signal to the sentry.

2.—*Guard over Horses.*

At least one man should be told off as guard over horses. During the daytime, when the horses are taken on piquet, they may have their girths slackened and the saddles shifted, provided that this is done one-third at a time, and there is no likelihood of immediate attack. They may also be fed and watered one-third at a time. But after nightfall, saddles and bridles should not be taken off. The horses that are being fed should be led a short distance away from the others.

3.—*Reconnoitring Patrols.*

At least one reconnoitring patrol should always be detailed and sent out immediately the piquet has taken up its position. In the absence of contrary instructions, this patrol will be detailed by the piquet commander, otherwise it will be detailed from the support. In the case of mixed outposts or infantry outposts to which some mounted troops are attached, the duty of providing the reconnoitring patrols will as a rule fall to the mounted troops.

The principal object of a reconnoitring patrol is to ascertain if the country is clear of the enemy for a stated distance, say, five to six miles, or even more in certain cases, though in the case of infantry acting alone this must usually be reduced to two or three miles. The closer the country, the more carefully should it be patrolled. When the opposing forces are close to each other, mounted patrols should maintain constant touch with the enemy. Where the country is suitable, cyclists may be employed with advantage, particularly at night. Unless the country is very thick, or the weather misty, it will seldom be necessary to send out infantry patrols so long as mounted troops are patrolling the front. At night the duty of patrolling will usually fall on the infantry. In that case they should patrol along roads or tracks for a mile or so, searching ground where the enemy's scouts may conceal themselves. If a force halts for more than one day on the same ground, the hours of sending out patrols, and the route by which they travel should always be changed. They should invariably be sent out before sunrise.

The commander of the piquet should always ascertain from the officer commanding the outposts—or that section of the outpost of which his piquet forms part—the following orders with regard to reconnoitring patrols:—

Orders to be Ascertained by Commander of Piquet.

(*a*) The latest that is known about the enemy;
(*b*) Whether patrols are to be sent out more than the usual distance;
(*c*) Whether patrolling is to be continued throughout the night;
(*d*) At what hour or hours reports are required;
(*e*) The exact extent of front which patrols from the piquet must cover;
(*f*) The number of patrols to be sent out from the piquets or supports on either flank.

Duties of the N.C.O. of a Reconnoitring Patrol.

The commander should give the foregoing orders to the N.C.O. of each patrol; and if there is more than one patrol, he should apportion the ground among them.

A patrol should consist of not less than three men and a N.C.O. If there are sufficient men, it will usually be best to send out two small patrols of, say, three men, rather than one large one of, say, six men.

Before going out each N.C.O. should, as far as possible, plan out from a map, if one is available, the best line to take. He should ascertain, by a study of the contours and the position of the woods, the ground which will be visible from each high point, and then endeavour to reach these heights in succession, thus practically covering the ground which he is detailed to search. The patrol or a scout must actually pass through and search any country which cannot be seen in this way.

Points to be Reported On.

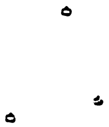
The points to be reported on by the N.C.O. of each reconnoitring patrol will vary to some extent according to the circumstances, but the following information at least will be required:—

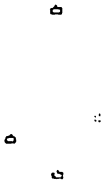
(1) The time of departure;
(2) The direction taken;
(3) Description of the country in the immediate front of the outposts, as well as the nature of any approaches which might be used by the enemy;
(4) Whether there is any ground in the vicinity where a large force could assemble unobserved by the outposts, and if so, from what point this ground could be watched;
(5) Description of country beyond the immediate vicinity of the outposts, and whether it is intersected by roads facilitating the movement of troops;
(6) The farthest point from the outposts actually reached by the patrols, and whether a stretch of country is visible beyond that point;
(7) Whether there is any indication of the enemy, and whether any information about him is obtainable;
(8) Demeanour of the inhabitants;
(9) Whether the vedettes or cossack posts, or in the case of infantry, sentries or sentry groups, are visible from the front;
(10) Time of return to the piquet.

On passing the vedettes the N.C.O. of each patrol should state the direction which he intends to take, and the direction from which he will return, as well as the anticipated time of his return.

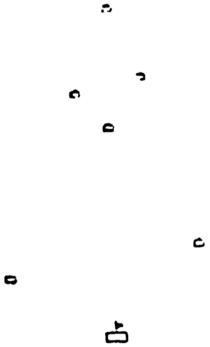
The Best Formation for a Patrol.

The best formation for a patrol to adopt, if there are three individuals, is this :— or four individuals :—





or, in the case of a large patrol, this :—



Patrol to Reconnoitre, Not to Fight.

"To gain information without being seen, and to communicate it to the Officer Commanding, and, if possible, to avoid fighting," must be the maxim of the reconnoitring patrol. The duty of a patrol is to reconnoitre and not to fight.

A patrol should adopt very much the same principles as a scout; vide "Reconnaissance," pp. 77–83.

If Touch with the Enemy is Obtained.

If a reconnoitring patrol obtains touch with the enemy, or if it is already in touch and anything is observed which points to an immediate movement on his part, a man should at once be sent back to the commander of the piquet with a report, while the patrol remains in touch with the enemy. The N.C.O. of the patrol should direct the man to come back again to him if possible, in order that he may know that the message has been safely delivered.

The points on which the N.C.O. should report are set out under the heading of "Reconnaissance of a Position held by the Enemy," p. 118.

While remaining continually in touch, he should report immediately if anything further of importance is ascertained. When once touch has been obtained with the enemy, it should never be lost.

Patrolling by Night.

In order to give due warning of any attack which may be contemplated at dawn by the enemy, patrols should, as a general rule, be sent out some time before daybreak, if not earlier, and should remain out until after daybreak. If the patrols do not then return, they should send reports back soon after daybreak as to whether the ground is clear of the enemy or not.

Before taking a patrol out after nightfall, a N.C.O. should endeavour to ascertain the lie of all roads in the district which he has to patrol, since, in a country which is partially enclosed or very hilly, troops in any numbers will not be able to move except by the roads. He should therefore map out a course so as to patrol these roads as far as is possible. If the country is intersected by roads, he may not be able to patrol all of them, but he probably can so plan his course as to intersect roads at various points, and ascertain if there is any sign of movement on them.

To patrol a road at night, it is sometimes best to take a line parallel to it from which the road can be kept under view.

If it is a moonlight night, the patrol should, of course, endeavour to keep out of the open as much as possible.

At night, as in daytime, a patrol should if possible never return by the same route as it went out, because its presence may have been discovered and an ambush laid in the expectation of its return by the same route.

For patrolling roads, cyclists are especially useful both by day and by night.

When the ground is frozen the footsteps of a column may be heard for some distance.

On Returning towards the Vedettes or Sentries.

On the patrol returning towards the line of vedettes or sentries, the N.C.O. should see whether any sign of the vedettes or sentries is visible from the front. If so, he must, on his return, report the matter to the N.C.O. of the piquet, who should take steps to alter their position.

The N.C.O. should endeavour, particularly at night, to bring his patrol in at the point where he left the piquet line, since the vedettes or sentries will be expecting his return at this point, and will thus not be so likely to mistake him for the enemy.

4.—*Vedettes or Cossack Posts.*

Sentries or Sentry Groups.

Vedettes or cossack posts, or, in the case of infantry, sentries or sentry groups, should not be posted more than about a quarter of a mile from the piquet. The number of vedettes or cossack posts, or sentries or sentry groups, detailed must depend to a great extent on whether the country is sufficiently open to allow an extended view to be obtained. If it is, the number may be small, while if it is enclosed the number must depend upon the quantity of roads or tracks along which the enemy could approach. During the daytime, vedettes or sentries or the sentries of cossack posts or sentry groups may be posted singly, unless it is very important to guard one particular spot, or unless there is a likelihood of immediate attack. If double, they should be close enough to be able to hear each other, but not so close as to tempt the men to carry on a conversation. At night, all vedettes or sentries and sentries on cossack posts or sentry groups should if possible be doubled.

The commander of the piquet, or one of the N.C.O.'s, should personally post the vedettes or cossack posts, or sentries or sentry groups. If a more extended view can be obtained from a steeple, tower, tree, or other eminence, the sentry should generally be posted on it; the N.C.O. taking care to inform the sentry over arms or the connecting file of the fact.

Even at night a position on high ground has its advantages, because a sentry is in a better position to see lights or fires in the distance and also to hear any sounds.

It is almost needless to say that the ideal position on which to post every vedette or sentry is where he can see without being seen. The Russians made use of an ingenious plan to protect their sentries. Each sentry had at his post a straw torch stuck upright in the ground. When attacked, the torch was lit and it illuminated the ground over which the men advanced, while the sentry retiring a short distance remained in darkness.

The N.C.O. of a cossack post or sentry group is personally responsible for seeing that his post is always prepared for any attack, and that in the event of attack information is sent to the troops in rear in time for them to get under arms.

Points which a Sentry Must Know.

When posting a vedette or sentry the N.C.O. must see that each vedette and sentry thoroughly knows the following points in addition to those already given on p. 48:—

(1) The extent of front, and any particular places which he has to watch;

(2) The situation of the sentries on his right or left;

(3) The situation of his piquet, as well as the best way to it ;
(4) The situation of any detached posts in the vicinity ;
(5) The names of villages, rivers, etc., in view, and the places to which any roads and railways lead ;
(6) Whether any patrols or scouts are likely to return close to his post, and if so at what hour ;
(7) Whether anything particular was noticed by the last sentry ;
(8) The instructions as to opening fire, and the range to prominent objects ;
(9) How he is to deal with persons approaching his post ;
(10) The name of the officer commanding the outposts or the section to which he belongs.

Orders to a Sentry.

The general orders to a sentry are :—

(1) To watch his front continually, and never to take his eyes off it under any consideration, and to keep as still as possible so as to lessen the chance of being seen ;
(2) To report immediately any suspicious movement to the N.C.O. or senior soldier of the cossack post or sentry group, or failing that, to signal at once to the sentry on the piquet, continuing all the time to watch such movement ;
(3) To warn his group or piquet of the approach of any person or party, and when the nearest person is within speaking distance to call out " Halt, Hands up," at the same time covering him with his rifle. The group or piquet commander will then deal with such person or party in accordance with the instructions which will have been issued by the commander of the outposts. If any person does not obey the sentries, or attempts to make off, he must be shot at once.
(4) If an attack is threatened, to raise the alarm at once either by signal, or, in case of emergency, by firing.

In falling back on the piquet he should take care not to mask their fire. But he must only fall back if the attack becomes serious.

Orders to French and German Sentries.

The French sentries challenge thus, " Halte, là," twice. If the person challenged does not halt after the second call, the sentry fires. If he halts, the sentries call, " Qui vive ? " to which the reply is, " France, ronde," or " patrouille " or the name of the corps. The sentry then calls, " Avance, ———." The person, or if a party its leader, then advances and gives the countersign.

In Germany the challenge is, " Halt, wer da ? " If the person does not answer after the third call, the sentry fires.

Horses with Vedettes or Cossack Posts.

Vedettes or sentries on cossack posts are almost always dismounted. The reliefs are invariably dismounted, and remain as close to the vedettes as possible. When horses are taken on cossack posts, saddles and bridles must not be taken off. Everything must be ready for instant action. Only one-third of the horses are to be watered or fed at one time.

It lies with the commander of the piquet to decide whether or not horses should be taken on a cossack post. If the post is at some distance and likely to be attacked, and the orders are that in the event of the attack the posts fall back on the piquet, the commander will probably order the horses to be taken.

Reliefs.

The whole cossack post or sentry group is relieved every 6, 12, or 24 hours, the time varying according to the weather, shelter, and the work which it has to do.

The reliefs of a vedette or sentry are usually kept at the piquet, while the reliefs of a sentry on a cossack post or sentry group are always at the post.

When the men are very tired, or the weather is very bad, it will be best to relieve the vedette or sentry every hour, but in any case he should be relieved every two hours.

The vedette or sentry who is being relieved should pass on to the relief all the orders and information which he has received. The N.C.O. must see that this is done.

Great care must be taken by the reliefs passing to and from the piquet that they avail themselves of any cover there may be and are not seen from the front.

When one piquet relieves another, the commanders of both piquets should if possible go together to relieve the sentries, so that the commander of the relieving piquet can be informed on the spot itself of anything of importance.

For the same reason, patrols should be sent out, composed, if possible, of men of both piquets.

5.—*Visiting Patrols.*

The commander of a piquet or detached post is responsible for maintaining communication with the piquets or posts on either flank. For this purpose he should detail a visiting patrol, consisting usually of a N.C.O. and one or two men.

Though a piquet commander must satisfy himself that his sentries are alert and understand their duties, he should limit as much as possible any movements in the line of sentries which might be visible to the enemy. Consequently if the country is open and a visiting patrol would be seen from the front, he should maintain touch with the sentries by means of connecting files. At night, however, or if there is no risk of a patrol being seen, it may be sent on its rounds at irregular intervals.

Flags of Truce.

On the approach of a flag of truce, one sentry, or more if at hand, should advance and halt the bearer and his party at a distance from the post. The sentry will detain them until instructions are received from the commander of the outpost squadron or company. If instructions are given to allow the bearer to pass, he must be blindfolded and taken under an escort to the commander of the outposts. Except with the permission of the commander, no conversation is to be held with the bearer of the flag of truce or any of his party. If only a letter or parcel is brought, a receipt must be given for it and it must be forwarded immediately to the commander of the outposts. The bearer of the flag must then at once depart.

DETACHED POSTS.

Occasions when Used.

Since there is always a chance of a detached post being cut off, such a post should not be used except in case of necessity, but there are occasions and places when it is necessary, as for instance :—

(1) At a place on the front or rear of the extreme flank of a force, especially if it is at a place where the flank could be easily turned ;

(2) When it is desirable to watch either some position which the enemy is likely to seize for the purpose of observation, or some position in front of the outpost line where he might gather for attack.

When for tactical considerations no piquet is posted on the main lines of traffic, a detached post should be specially detailed to deal with people or traffic passing through the outposts.

The numbers employed on a detached post will vary in accordance with the duties assigned to it, but the usual number will be from six to twelve men under an officer or N.C.O.

The officer or N.C.O. in command should ascertain exactly the purpose for which the post is maintained, as well as the duties which he has to perform, and should then make his arrangements accordingly, acting in the same manner as stated in the case of a piquet. He should see that every man is ready to advance or retire at a moment's notice, and, if a good view can be got from the position, should mainly devote himself to watching the ground with his telescope or glasses. In case he may be compelled to fall back, he should plan out, at all events if he is in an isolated position, at least two separate avenues of retreat upon the main outpost line. Should the post be guarding an exposed flank, he must on no account fall back until the outpost line has been warned.

OBSERVATION POSTS.

Observation posts are used on all occasions when an extended view cannot be obtained from the outpost line, or when a different or even a wider view can be obtained from some point in the front or on the flank of the line.

When the whole outpost line is held by infantry, mounted troops will usually be detailed for observation work during the daytime, and withdrawn at night.

Any officer or N.C.O. in charge of such a post must be provided with a telescope, and should occupy himself in continually sweeping with his glass all ground within view. Meanwhile, the men may be engaged watching the various sections of the front, and should be relieved, say, every half-hour. One man should not be kept watching any point for long, because he is inclined after a time to become less keen in his observation.

On occasions when mounted troops form a line of observation posts ahead of the infantry outposts, they will be distributed on the same principles, and act in the same manner as laid down for piquets.

STANDING PATROLS.

As their name implies, they are patrols sent out to stand at some point and watch. Standing patrols are used principally to watch any road or route by which the enemy might approach the outposts, or where otherwise he might concentrate unseen. Since standing patrols, at all events of mounted troops, can be posted at some distance from the outposts, they are obviously of great value, particularly at night. There is an advantage in the fact that their employment involves a saving of horses. Standing patrols usually consist of two to eight mounted men or cyclists under a N.C.O.

Any N.C.O. in command of such a patrol must, of course, choose a point where he can get a good view, but if a good view is not obtainable, he will often find it best, when watching at night, to take up a position below some crest over which the road under observation passes. In this position he would be better able to see any of the enemy outlined against the sky in the event of their crossing the crest.

Owing to the fact that sound rises, he will often find it advisable on a still night to post one man on a tree or other height, while another should be told off to listen frequently with his ear to the ground, or to a stick placed on the ground, for any sound.

The men should be divided into reliefs, and one man should never be kept too long at any particular work, because his keenness of observation is likely to be relaxed after a while.

The horses on standing patrols must never be unsaddled.

Supports.

Main Duties.

Supports form the second line of resistance against any attack which may be made on the outposts. As their name implies, their main duty is to support the piquets whenever required, and accordingly they take up the most suitable position for this purpose, either at some cross-roads or other spot from which they can readily move to reinforce all or any of the piquets to which they are acting as supports. In addition to this, they detail sentries over arms, visiting patrols, and often reconnoitring patrols, as already explained.

The commander of the outposts will decide whether the supports may take off accoutrements, off-saddle and unharness teams.

Duties of the Commander of a Support.

Among the duties of a commander either of an outpost squadron or company, or of another body acting as support to one or more piquets—in addition to that of apportioning the extent of front for which he is responsible among the piquet commanders—may be mentioned the following:—

(1) To arrange a plan of defence in case of attack;
(2) To improve, if necessary, the means of communication between his support and
  (*a*) The piquets to which he acts as support, and
  (*b*) The supports on either flank, so that in the event of attack no time may be lost in rendering assistance either to his piquets or neighbouring supports;
(3) To post a sentry over arms;
(4) To detail a guard over horses;
(5) To open up and maintain connection by means of visiting patrols, not only with his piquets, but also with the supports on either flank;
(6) To visit his piquets and satisfy himself that everything is in readiness;
(7) To send out reconnoitring patrols either from his support or from the piquets, and to receive their reports and act accordingly.

Every endeavour should be made to settle the men down to rest as soon as is consistent with the proper carrying out of their duties.

Arranging a Plan of Defence in Case of Attack.

The commander of the support will receive his orders from the commander of the outposts, or the commander of the section if the outpost line has been divided into sections, as to the line which is to be held in the event of attack, and it is upon these orders, of course, that he must base his plan of defence. If, for instance, the piquet line is to be held, he must decide on the position which he will take up and how far he will divide his force—subject to any modification that may be rendered necessary at the moment—in order to support, if required, each of his piquets. Each particular case must depend on circumstances, and more especially on the conformation of the ground. In one case he may be better able to hold the line of front by keeping his force at one tactical point, while in another he may do better to divide his force so as to reinforce each piquet.

If one of the flanks is exposed, it may be better to detail a detached post specially to guard that flank.

After deciding on his plan of defence he will inform each piquet commander, so that he may know from what point to expect assistance.

The commander of the support is held personally responsible that an attack finds him fully prepared, and that the troops in his rear receive intelligence in time to take up their positions to resist the attack.

Improving the Means of Communication.

Seeing that the main duty of the supports is to render prompt assistance at any point, it is essential that there should be ready means of access to the front or flank. If easy access does not already exist, it must as far as possible be prepared by, for instance, cutting gaps in hedges, breaking through walls, or supplying means for crossing streams.

Sentry Over Arms.

A sentry over arms must always be posted, not only for the reason that he prevents the support being surprised, but more especially to watch for any signals from the front or for messengers from the piquets. In very close country it may be necessary to post a connecting file or files between the support and the piquets. If the support is quartered in a building, two sentries at least should be posted outside.

The same rules apply to this sentry as to a sentry over arms at a piquet (see p. 49).

Guard Over Horses.

A guard over horses will, of course, always be detailed.

Unless there is a likelihood of immediate attack, the horses may be off-saddled, but if so the men must remain in readiness to saddle and turn out at a moment's notice.

Should the watering-place be at some distance, not more than one-third of the horses should be watered at a time.

Should a night attack be likely, all horses must be kept saddled, because it is essential that at such a time there should be no delay in supporting the piquets. If the commander decides to reinforce on foot, the horse-holders should remain with the horses in order to be ready to take them to any point immediately they are required.

Visiting Patrols.

Visiting patrols must be detailed for the following purposes:

(1) To keep up communication with
    (*a*) The piquets;
    (*b*) The supports on either flank;
    (*c*) The reserve (if any);
(2) To patrol any ground lying between the piquets and supports, which cannot be observed by either.

These visiting patrols will usually consist of a N.C.O. and two men.

Visiting the Piquets.

The commander of the support will personally visit each of his piquets, as well as their line of vedettes or sentries, and satisfy himself that everything is in readiness.

Sending out Reconnoitring Patrols.

The commander of the support will see that reconnoitring patrols are sent out either from the support or from the piquets, and that their reports, or at any rate copies of their reports, are forwarded to him.

Advantages of Reconnoitring Patrols being Detailed from the Support.

Two advantages in the fact of the reconnoitring patrols being detailed from the supports are, first, that the piquets are not temporarily weakened by the withdrawal of men required for the patrols ; and, secondly, that the men who have been on patrol are allowed more rest than is perhaps consistent with that state of readiness for instant action which is the very essence of piquet duty.

Reserve.

When used.

It is laid down in Field Service Regulations that the provision of a reserve depends upon circumstances, *e.g.* when the outpost force is a large one, or when the outposts hold the ground which is to be occupied by the main body in case of attack, because it is then of the utmost importance that the outpost line should hold such ground until the main body has occupied it. The reserve, if required, will be detailed by the outpost commander and will always be formed of a complete unit with mounted troops and usually some guns attached. It may be often advisable to divide the reserve into two or even more parts in cases, for instance, where the country is intersected or difficult.

If no reserve is specially detailed, the inlying piquets of the force which furnishes the outpost troops will act as a reserve.

Inlying piquets consist of troops specially detailed to remain in camp in readiness to turn out at a moment's notice. The commander of the outposts will decide whether the reserve will go into quarters or bivouac, and whether the troops may take off accoutrements, off-saddle and unharness teams.

PART III.

RECONNAISSANCE AND TRANSMISSION OF INFORMATION.

RECONNAISSANCE.

Means by which information is obtained in war.

Information in war is obtained either by :—

(1) Reconnaissance ;
(2) Secret agents ;
(3) The questioning of inhabitants, prisoners or any of the enemy's deserters, sick or wounded ;
(4) The acquisition of documents, such as orders, messages, etc., and the tapping of telegraph and telephone lines.

Only the first of these methods is within the scope of this book.

Classes of Reconnaissance.

Reconnaissance may be either with regard to the enemy himself, his forces and dispositions, or to the features and resources of the theatre of operations.

Reconnaissance may be divided into three classes :—

(*a*) Strategical reconnaissance, which consists in obtaining information, before the hostile forces are within striking distance, as to the dispositions of the enemy and his lines of advance, his bases, his depôts, his lines of communication and the traffic on his railways, as well as information bearing on our own lines of advance and also the strategical points in the theatre of war. On this information, supplemented possibly by what he may obtain by one of the other means mentioned above, the Commander-in-Chief will base his strategical plan.

(*b*) Tactical reconnaissance, which consists in obtaining information, once the hostile forces are within striking distance of one another, of the tactical dispositions of the enemy. On this information, supplemented possibly by what he may obtain by other means, including personal reconnaissance which is very valuable, the commander of each force will base his tactical plan.

(*c*) Protective reconnaissance, which consists in obtaining information for the immediate protection of every body of troops, and also in preventing the enemy from obtaining information as to our own troops.

Reconnaissance is carried out by the Independent Cavalry, the Protective Cavalry, and the Divisional Cavalry, and when operating alone or in country unsuited to Cavalry, or, when in very close touch with the enemy, by the Infantry as well. In addition to this, it may be carried out by officers in balloons or aeroplanes. (For aerial reconnaissance, see pp. 83–89).

A. Reconnaissance by Independent Cavalry.

(*a*) *Before the Forces are within Striking Distance.*

The commander of the cavalry will usually send forward :—

(1) Strategical reconnoitring patrols to gain the fullest information as to the enemy's main forces.

(2) Tactical reconnoitring patrols (*a*) to locate the hostile cavalry, and (*b*) to provide for the immediate protection of the cavalry force to which they belong.

1. *Strategical Reconnoitring Patrols.*

The work of strategical reconnoitring patrols is of the very highest importance, and will usually be undertaken by officers. These patrols will be directed against the probable lines of the enemy's approach, places where signs of him are likely to be found, and to the strategical points which he will probably endeavour to occupy.

The success of strategical reconnaissance, as indeed of all reconnaissance, depends to a large extent on organisation. The service of reconnaissance must be thorough in every respect. Patrols should be directed against the enemy's main forces from practically every direction. Experience has shown that a considerable number of these patrols will gain but little information, but this information, which when viewed by itself appears of but small value, becomes often of the greatest use when it it is compared with other reports and pieced together by the Intelligence officers. The patrol leaders will be given all the information available about the enemy, which bears on the work on which they are engaged. They will also be informed generally of the Commander-in-Chief's plans, so that they may the more readily appreciate the essential points to be ascertained, and realise the importance or otherwise of the information which they may gather.

The area which is to be reconnoitred, including as it may a very wide extent of front, will be divided between these patrols. The patrol leaders must throughout retain in their minds a clear view of the strategical situation, and resist the temptation which will so often occur of sending back despatches of relative unimportance, thus dissipating their despatch-carrying resources on which a heavy call will be made when important information is obtained.

Each patrol will include, say, at least six well-mounted and experienced despatch riders. This number will provide for the carrying of three messages, each in duplicate. The remainder of the patrol can then themselves return with the final message, probably to the contact troop or squadron which has been sent out to support them. Arrangements must, however, always be made for maintaining touch with any large body of the enemy, whom they may have found.

When the Independent Cavalry have defeated the enemy's cavalry, or the situation is otherwise favourable, strategical reconnoitring patrols must be directed against the enemy's communications with a view to ascertaining the extent of his reserves and their line of approach.

It is laid down that in country which is very exposed, or otherwise unfavourable to the employment of cavalry, detachments composed of cavalry and infantry may often obtain good results, since the infantry is able to assist the cavalry in the actual fight, and to afford them freedom to reconnoitre, even at a time when the infantry is actually engaged.

For the general principles as to carrying out a reconnaissance, see p. 77.

2.—*Tactical Reconnoitring Patrols.*

(*a*) *To Locate Enemy's Cavalry.*

Tactical reconnoitring patrols must use every endeavour to get at once into touch with the enemy's cavalry. In order to do this, they may have to drive back the hostile patrols.

With tactical reconnoitring patrols, as with strategical patrols, the area which is to be reconnoitred must be divided between the patrols which are sent out, and the district for which such patrol is responsible must be clearly defined, as well as the farthest point to which they should go if the enemy's cavalry are not found. The patrols should endeavour to close in on the enemy's cavalry from practically all sides. The patrol leaders must be given all the information available about the enemy which bears on the work on which they are engaged. They will also be informed generally of the cavalry commander's plans, so that they may the more readily appreciate the essential points to be ascertained.

Patrol leaders, though noting carefully the direction from which the enemy's patrols may have come as indicative of the direction of his cavalry, will not of course under ordinary circumstances concern themselves with these small bodies, but press onwards—through probably the line of the enemy's contact squadrons—towards the main body of his cavalry; each patrol, however, being careful to remain within the district assigned to it, so as not to cover the ground of another patrol, and thus perhaps leave another district unreconnoitred.

Each patrol will include, say, at least four well-mounted and experienced despatch riders. This number will provide for the carrying of two messages, each in duplicate. The remainder of the patrol can then return with the final message to the contact troop or squadron which has been sent out to support them.

For general principles as to carrying out a reconnaissance, see p. 77.

At a later stage, when the opposing masses of infantry are in close touch, the tactical reconnoitring patrols of the Independent Cavalry may be directed against the enemy's flanks.

(*b*) *To Provide for Immediate Protection.*

Other reconnoitring patrols will be used solely for the purposes of guarding against a surprise and keeping at bay any of the enemy's tactical patrols who may be endeavouring to ascertain the strength and disposition of the Independent Cavalry.

Contact Troops or Squadrons.

When required by the reconnoitring patrols, contact troops or squadrons, whichever may be necessary, will be pushed forward from the main body of the Independent Cavalry.

Their duties will be:—

1. To support the patrols;
2. To provide, if necessary, reliefs for the patrols; and
3. To serve as a centre for collecting reports from patrols and submitting them to cavalry headquarters, as well as to army headquarters, in the case of really important information.

When the distance of the patrols from the main body of the cavalry is great, or other circumstances, such as a wide extent of front, require it, two or more contact squadrons may be pushed forward from the main body, or on occasions even a mass of cavalry may be used to form a centre.

The commander of a contact squadron must at night take special precautions against surprise. He may often find that it adds to his security to move his quarters during the night.

(*c*) *After the forces are within striking distance.*

Tactical Patrols.

The duty of reconnoitring the country and reporting to the General the nature of the country over which he may expect to operate, will be entrusted to selected officers with a good eye for country.

The following are amongst the principal points which they should note:—

1. The natural features on which one of the flanks of the cavalry might rest, and whether the ground is sufficiently impassable to enable that flank to be left unguarded;
2. Whether the ground would offer any similar protection to the enemy;
3. The country along which an advance might be made with a view to securing "outer lines" (see p. 158);
4. The nature of the ground with a view to determining the shape of the attack;
5. The defiles, whether they be between hills, woods, villages, or any other natural features which limit the area of attack.

Tactical patrols are also used when the Independent Cavalry is within striking distance of the enemy, and are sent out immediately the force concentrates for the "approach march." They are sent to locate the enemy, and, when there is the chance of surprising him, will often take the place of the advanced guard. Their duty will be to give the commander complete information as to the disposition of the enemy's cavalry and timely warning of their approach. Since any important information must be delivered immediately, messages will usually be verbal and not written, and only the best mounted men should be employed as despatch riders.

Other tactical patrols will move on the flanks in order to give warning of any movement by the enemy against the flanks.

For further information as to flanking patrols, see p. 21.

Supporting Squadrons.

When required, squadrons may be detached to support the tactical patrols and assist them to drive back the hostile patrols. Great stress, however, is laid on the necessity of these squadrons rejoining on their own initiative immediately their work is completed, so that their assistance may not be lost at the critical moment.

B. Protective Cavalry.

(*a*) *Before the Forces are within Striking Distance.*

Tactical Reconnoitring Patrols.

Until the opposing armies are within striking distance of one another, the reconnoitring patrols of the Protective Cavalry will usually be occupied in searching the country for some distance ahead of their force for any bodies of the enemy, and particularly of his mounted troops, who may have evaded the Independent Cavalry and be endeavouring to pierce the screen which covers the front of the advancing positions. The extent of front which these patrols should cover will therefore be considerable. The number of patrols must vary of course with the country, and they will be governed by practically the same principles as those set forth under the head of "Tactical Reconnoitring Patrols" of Independent Cavalry on p. 70.

The general principles of this reconnoitring work are given on pp. 77–83.

(b) *After the Forces are within Striking Distance.*

Tactical Reconnoitring Patrols.

At a later stage when the opposing forces approach within striking distance of one another, tactical reconnaissance becomes a most important duty of the Protective Cavalry, who must assume a vigorous offensive, driving in the enemy's advanced troops. The reconnoitring patrols of the Protective Cavalry must likewise take a more offensive *rôle*, since the duty will fall on them, if it has not already been carried out by the Independent Cavalry, of clearing up the tactical situation by piercing the enemy's screen and ascertaining the strength and depth of his columns, the extent of front which each covers and the exact direction of their march. To enable them to penetrate more readily the enemy's screen, these patrols should be supported by contact troops or squadrons, as may be required. If the situation requires it, the Protective Cavalry may concentrate to break through the enemy's screen and discover his dispositions, while the advanced guards of the various columns will throughout co-operate with the Protective Cavalry in clearing up the tactical situation. The contact troops or squadrons, besides assisting these patrols to press through the enemy's screen, will carry out the general duties specified under the head of "Contact Troops or Squadrons" (see p. 71).

In order that the information gained by these patrols may be as far as possible complete, thorough organisation of this service, as already described under the head of Independent Cavalry, is essential. When the importance of the information which is available, if only thoroughly sought for, is considered, practically no sacrifices by these patrols can be too great in order to obtain it.

If the enemy's independent cavalry is undefeated, the number of these patrols will be limited by the necessity of maintaining intact as large a force of cavalry as possible in order to strike the enemy's cavalry immediately opportunity offers or to ward off a blow. But if this necessity does not exist, the number of the cavalry employed on patrol duty may be increased. In any event, however, the whole front over which the enemy is advancing must be covered by these patrols, and in cases where it would not be possible to advance by day, every advantage must be taken of darkness. When the patrols themselves can advance no further, single scouts must do their utmost to press forward. If it is impossible to work round or through small bodies of the enemy at any point, it may be well for the contact troop or squadron to engage the enemy while the scouts pass round his flanks. If the country is close, infantry may often be usefully employed in this way.

Reconnaissance of a Position.

Prior to the delivery of the attack, every position should always, if possible, be carefully reconnoitred. Time so occupied is seldom wasted, since a reconnaissance often discloses many unforeseen dangers and difficulties, to meet which due preparation can be made, whereas if difficulties are not known or realised at the time when the attack is launched, they are much less easy to overcome. More than that, it may disclose the weak points in the enemy's line or position ; in which case it might mean that the direction of the main attack would have to be changed in order to attack these weak points. Reconnaissance of the enemy's position is fully dealt with on pp. 118–120.

For particulars as to reconnoitring a position held by the enemy, see p. 81 ; and as to scouting generally, see p. 77.

Reconnaissance during Battle.

During an engagement reconnaissance must be continuous. The situation is changing constantly, and it should be the aim of patrols to keep the commander informed of every important move, and more particularly of the position and any movement of the general reserve, and also to inform him of the enemy's artillery positions.

During an action opportunities sometimes occur of penetrating the enemy's front, but at all times his flanks are likely to prove favourable points at which to enter his line.

During an action, as really on all other occasions, the best results can only be obtained by systematic organisation of the service of reconnaissance. Patrols and scouts must be directed against the enemy from practically all directions. They must close in on him. Though a small number of the patrols will gain important information, many others will gain but little, but even their information when pieced together may be of the greatest importance, and, in addition, may serve to confirm or refute conclusions which have been formed by the Intelligence Staff.

Protective Patrols.

While some patrols are engaged in striving to clear up the tactical situation, others must be detailed for the immediate protection of the force and to prevent the enemy's scouts and patrols from attempting, as they certainly will, to penetrate the screen and gain the fullest information as to the advancing infantry. No one patrol, can as a general rule, effectively carry out the double duty at the same time; one or other of the duties must suffer.

C. DIVISIONAL CAVALRY.

(*a*) *Before the Forces are within Striking Distance.*

Tactical Reconnoitring Patrols.

The tactical patrols to the immediate front and flanks of each division will be formed from the Divisional Cavalry, who have necessarily a more restricted scope than the Independent or Protective Cavalry, but have none the less to play an important *rôle.*

If the Protective Cavalry have been unable to cover the whole front, and a body of the enemy's cavalry has broken through, the patrols of the Divisional Cavalry, when they encounter them, must be relied on to give the earliest information to the commander of the advanced guard, for by themselves they will not be in sufficient strength to stop any but the smallest forces of the enemy's cavalry. In addition to this, they must at all times be on the look-out for hostile patrols and scouts.

For further particulars as to patrols with Van Guards and Flank Guards, see p. 14 and p. 21 respectively.

(b) *After the Forces are within Striking Distance.*

Tactical Patrols.

At later stages and when the forces are within striking distance of each other and the respective advanced guards engaged, much remains to be done to prevent the enemy endeavouring, as they certainly will, to pierce the line and ascertain the general dispositions of the divisions and the position of the reserves.

METHODS OF CARRYING OUT RECONNAISSANCES.

A patrol or scouts may be ordered either to :—

(1) Ascertain the whereabouts of the enemy ; or

(2) Ascertain whether or not the enemy is in a particular tract of country.

General Principles.

Before a patrol or scouts start they should be given all the information about the enemy which can safely be imparted, and in order that the country over which they intend to go may be worked systematically they should themselves make a close study of the best map which is obtainable.

In a country which is hilly or is open and undulating they can, by a study of the altitudes and general contour lines within this area, gain a general idea of the district visible from each of these high points. By going from one high point to another, they will be able to sweep with their glasses the whole of the area over which they are working.

If, on the other hand, the country is flat and enclosed, they must study the general lie of the roads between their own position and where the enemy is expected, and arrange to traverse the whole of the roads along which any large numbers of the enemy at all events could move. If there are a number of roads running in the direction of the enemy, scouts will usually, if time and numbers are short, have to limit their work to traversing these roads and leave the cross-roads untouched, provided there is no great distance between the various roads running in the direction of the enemy. Should there be tracks running through wooded or hidden country, which might be possible for a force of infantry accompanied only by their first line transport to traverse, it may be necessary for the scouts to strike these tracks at various points. Scouts should remember that even a battalion of infantry marching in fours and accompanied by its first line transport occupies a road space of 600 yards and is almost certain to have an advance guard, however small, which will thus add to the length of the column. Consequently by striking a track at given points scouts may be able to search it almost as well as by traversing the whole of it.

Before starting, scouts or patrols should thus map out their route, and make themselves thoroughly acquainted with the means by which information is to be transmitted, and the places to which it is to be sent. Should an inhabitant of the country be taken, he may be usefully employed in leading a spare horse. Unless the inhabitants are friendly, the less scouts visit or are seen from any dwellings the better. News travels so rapidly that if scouts are seen all their work may be spoilt. There are other ways of obtaining food and forage than by asking for it in the daytime.

If working in a hilly or open and undulating country scouts should never ride on to a tract of country without searching it well beforehand with their glasses, and, if possible, watching it for a short time to see if they can notice any movements. The same rule applies in enclosed country wherever a long stretch of road is visible or a village or some defile has to be passed.

Scouts, when engaged on distant reconnaissances, should remember that it is often best to watch by day and move by night. They should at all times bear in mind the enemy's habits as regards marching and hours of marching; think of the places where they could rest a force if they were themselves in command, and search these places well with their telescopes, or, if this is not possible, work on to the ground itself. They should throw themselves into the spirit of the enemy, and think what he would do. In open country they should follow up each road or track, letting their glasses travel along it, and also search around any piece of water where the enemy might be either watering or camping.

Let them keep the fact well in mind that the enemy knows he is being looked for, and give him credit for not allowing himself to be seen in the open. Stonewall Jackson often marched his men many miles round when he could find a woodland track rather than take the shortest way by the turnpike.

Scouts should remember that Napoleon's maxim, "Mystify, mislead, and surprise your foe," which should be theirs, is probably their enemy's also.

If reconnoitring in a hilly country, scouts, when they have reached one of the heights which they had arranged to climb, should "set" their maps and check with their previous calculations exactly what ground they have covered with their glasses, roughly marking it on the map. It is very probable that some shoulder on the height on which the scouts are standing prevents them from seeing some dip which they had thought could be seen from this height. In order to be able to search this dip, they will have to push on to ground from which it can actually be seen, keeping as far out of sight of the dip as possible. This done, they should go on to the next height, and so on; but though the ground may appear clear in front their eyes should never rest for a moment, but be constantly on the look-out for tracks or other signs. The enemy's scouts, themselves unseen, have only to catch a glimpse of them to make it very improbable that they will take back any information at all.

Just as when shooting big game one studies their habits, so should a scout study the methods of his opponents, whether, for instance, they usually move by night or by day, by dashing or by creeping. But inasmuch as when one is hunting game, one is usually looking for only one particular species at a time, it is obvious that the work of a scout is not only as dangerous but twenty times more difficult, since pitted against him at one and the same time are all sorts and conditions of men. He must, therefore, invariably be prepared to meet, not the worst of the enemy's scouts, but the best.

Covering Up Tracks.

The Scouts should always remember that their tracks may betray them, and should therefore take precautions from time to time to leave no sign of them. They may do this either by riding over stones or very hard ground, or by entering a stream and wading up or down it for some distance, coming out preferably on the same side as they went in. Even on soft ground they may make their tracks less conspicuous by keeping off any beaten route where they would be expected.

Precautions on Sky-Line.

If it is necessary to look over a sky-line, or a ridge, which may possibly be in close proximity to the enemy, a scout should creep up to it, with helmet off, first pushing his glass just over the top, and then raising his head very slowly. Just as when stalking game if one's head is raised very slowly, one can often stare at the game, and they can stare back again in one's direction, and, on dropping one's head again inch by inch, they will probably resume their feeding, so, in scouting, a head appearing and disappearing suddenly on a sky-line may catch the eye even of an inexperienced man. When stalking game, it is better to spoil the look of one's breeches rather than miss a shot. How much better then, relatively, is it in war to wear them through and get one's information, rather than be shot and get none. If the sky-line or a very open piece of ground must be crossed, it is often best to dismount and walk, so that one's horse is between one and the enemy, keeping one's head down and rifle at the shoulder, and stopping occasionally to let the horse feed. If this is well done, it is possible that the enemy's sentries may think it is merely a loose horse.

When Enemy Located.

Directly the enemy has been located, the scout should find out whether he is encamped or on the march.

If Enemy Encamped.

If the enemy is encamped, or has taken up a position, it will be necessary for the scouts to begin the survey of that position at some considerable distance from it, searching the intermediate ground with field glasses so as to ascertain and, if possible, avoid the whereabouts of any outposts. Since field guns have a range of at least 6,000 yards, they should note and write down, when moving forward, the cover available for troops advancing within the zone. A man who is himself unseen has obviously the best chance of gaining information, and for this reason every precaution should be taken when advancing to keep under cover. Full advantage should be taken of all dips and hollows, and they should, if possible, never pass over any ridge which may be a sky-line when viewed from the enemy's standpoint.

The exact points for the scout to note in regard to the enemy's position, strength, etc., are detailed fully in "Reconnaissance of a position held by the enemy," see pp. 118–120.

If Enemy on the March.

If the enemy is found to be on the march, the scouts should endeavour to take up a position from which they can obtain a good view of the moving columns. Besides noting the formation adopted on the march, the direction taken, the amount of transport and any other points likely to be of value, they should endeavour to estimate the numbers of the enemy. The strength and composition of a column may sometimes be gauged by the strength and composition of its advanced guard.

To Count Troops on the March.

A good rule by which to count troops on the march is to note the time each body takes to pass a given point. For instance, 5 guns and limbers or 5 wagons; 250 cavalry, in fours, at a trot; 120 at the walk; 200 infantry, in fours, will pass any given point approximately in one minute. If troops can only be seen at a distance, the length and composition of the column should be reported, as from this the staff officers will be able with the aid of their road spaces table to tell for all practical purposes the strength of the columns.

As to judging distances laterally, see p. 338.

India, for numbers passing in a given time, see pp. 569, 570.

Advantage of Scouts Working in Pairs.

Before getting detailed particulars of the enemy's position or strength on the line of march, it may be important at once to send back a preliminary despatch. If the scout is unable to send back a preliminary despatch, he will always feel that he is the sole repository of the information gained, and that, should he fall, the General Officer Commanding will never get the information, which might be of the greatest importance. The knowledge of this must tend to make him less willing to risk everything to obtain that fuller information, which he would at once attempt to obtain, if he felt that his first message was safe. On the other hand, if the country is at all open, better work is done and done easier, if the scout goes by himself; but still it is better, on the whole, for him to be accompanied by another scout up to a certain point. This man can there be left to keep an eye on the other's movements, as well as to watch the enemy's position, besides being ready to take back any report. Moreover, it enables a scout to remain continually in touch with the enemy, which is of great importance in view of any night march or other sudden change which the enemy may make in his dispositions.

Ascertaining if the Enemy is in a Particular Tract of Country.

When instructed to ascertain whether the enemy is in a particular tract of country or not, scouts before starting should make a study of any available map, and also get the limits of their district clearly indicated on that map. They should ascertain along which route the commander proposes to move, in addition to the time when, and the actual place where, they are to hand in their report. They must also be told all that can be safely imparted about the enemy in that district.

They should proceed to carry out their work in the same way as in the case of scouts "Ascertaining the whereabouts of the enemy," p. 77.

Scouts must remember, especially when engaged on this work, that "negative information" is often of the greatest value—that is to say, information to the effect that the enemy is *not* to be found in any particular locality.

AERIAL RECONNAISSANCE.

Means by which Reconnaisance may be effected.

Reconnaissance from a height above the ground may be effected by :—

1. Captive balloons.
2. Free balloons.
3. Man-lifting kites.
4. Aeroplanes.
5. Dirigible balloons.

Of the first three, a captive balloon is on most occasions undoubtedly the most suitable for military purposes.

1.—*Captive Balloon.*

The British Service Balloon can on a calm day take up two men to a height of from 1,000 to 1,500 feet, or one man to a height of from 1,500 to 3,000 feet. With a slight wind blowing, only about half these heights can be attained, and it is then better for only one observer to ascend. In England the average wind during the year at a height of 1,000 feet is between 18 and 20 miles an hour. Under these conditions, one man can in an average-sized balloon get up to 1,500 feet or more and make observations with field glasses.

It is found that the most useful height for observations is from 1,500 to 2,000 feet, this may therefore be taken as the usual working height of a captive balloon.

In all reconnaissance work, in the presence of the enemy, there comes a time when the cavalry can make but little headway, and when they have to make such long detours that the information they give of the enemy in our front is very slow in coming in, and consequently must be supplemented by other means. This is usually the moment when the proper *rôle* of the balloon begins. A rapid ascent and short observation may clear up the situation, but it is of the utmost importance to get the balloon as near the front as possible. A balloon wagon with gas, tackle, and sappers to work it can move as fast as field artillery.

A balloon may also be used during a battle to watch the enemy and particularly to assist the artillery by indicating targets on which they can employ indirect fire.

The danger of the balloon being struck by artillery fire must of course always be reckoned with, and for this reason the balloon should, if artillery open against it, seldom be kept at the same altitude for more than a minute or two, and if the firing continues it will be best to descend and move the position of the balloon wagon. Skilful artillery may easily get the range of a balloon in a few shots.

2.—*Free Balloons.*

The principal use of free balloons is to float across an invested town or fortress so that photographs may be taken which show clearly the details of the defence. They may also be used on occasions to float across country which is in the hands of the enemy. It must always be remembered that the currents of air vary greatly at different heights. The current at 2,000 feet has been known to be moving due south, while that at 3,000 feet was moving in exactly the opposite direction.

3.—*Man-lifting Kites.*

In windy weather, when the use of a captive balloon would be impossible, man-lifting kites may be used for observation purposes.

The height at which they can be most successfully used is from 1,000 to 2,000 feet. The range of view is the same as that of a balloon at the same heights. They are practically invulnerable against artillery fire. The remarks contained in the paragraphs relating to captive balloons apply to man-lifting kites. The latter cannot be moved so quickly as a captive balloon.

4.—*Aeroplanes.*

Aeroplanes are obviously of great assistance in reconnaissance, both tactical and strategical. They can also be used for carrying messages and despatches, also staff officers and others from point to point when necessary. Their offensive power, though as yet undeveloped, will ultimately be considerable. Their speed, wide radius of action, and mobility render them indispensable to an army in the field. The invisibility of aeroplanes at a height of 3,000 feet render them secure against artillery fire from below, and undoubtedly the best means of attacking aeroplanes is with aeroplanes. Every aeroplane carries a skilled observer in addition to its pilot. The remarks in the following paragraphs as to the extent to which objects can be observed from dirigible balloons apply equally to aeroplanes.

5.—*Dirigible Balloons.*

The chief *rôle* of the dirigible balloon is undoubtedly reconnaissance. This will probably necessitate their being able to rise, when required, to a height of at least 5,000 feet, and remain at that height for some hours, and to have a radius of operation of not less than 125 miles. They can conveniently carry wireless telegraphy apparatus, and so keep constantly in touch with their headquarters. Their offensive powers, when developed, will be considerable. Dirigible balloons are particularly suited for night work, and, when secrecy is a necessity, the engines can be stopped, all lights extinguished, and the airship allowed to drift in complete silence as an ordinary free balloon. The reconnaissance of which they would be capable appears to include, besides that of the enemy's forces and ships within that radius, that of his seaports and depôts. In savage warfare, at all events, their moral effect also would probably be an important factor. The subject, however, is outside the scope of this book.

Extent to which objects can be observed.

It is a mistake to imagine that everything is clearly visible from the air. At a height of 1,500 feet it is impossible, for instance, to see into the bottom of a valley 3 miles away when the valley runs across the line of sight, should the slope down to the valley be steeper than 6°. Similarly, on flat ground, trees 50 feet high afford complete cover for troops for distances beyond the trees of about 100 yards for every mile of distance, thus: at 5 miles distance there would be 500 yards of dead ground on the far side of the trees. So long as troops remain motionless on such ground they cannot be discovered, and it is only when they begin to move that they become visible to the observer.

In good weather, with ordinary glasses, small bodies of troops, such as individual squadrons, battalions, or batteries can be clearly seen, when in close order, at a distance of 5 miles. Large bodies in open country on a clear day can be seen at 7 or 8 miles. Camps also can be clearly seen at this distance. In South Africa movements of large bodies of troops were, owing to the dust, discernible up to 15 miles.

Ordinary fieldworks, when not carefully blended with the surrounding country, can be made out at from 4 to 6 miles, but are not easily distinguishable from natural features of the ground. It is impossible to tell dummy trenches from real ones.

Roads, when they can be seen, stand out clearly, and consequently troops marching along them are plainly discernible.

A company of infantry in khaki can be seen distinctly on grass, but it is difficult to distinguish on plough or heather.

Artillery, when marching, is easily seen, but when ready for action it is hard to discern it unless the horses can be seen.

Mounted troops, on account of their horses, are more easily seen than infantry.

Railways, when they run up and down the line of sight, are plainly seen, especially when they run along embankments or through cuttings. A railway, however, running at right angles to the line of sight can sometimes only be located by observing trains moving along it.

Rivers, canals, and water generally are always very visible.

Bridges of any size over water stand out prominently, and it is even possible, on a sunny day, to see the construction of a bridge by looking at its shadow on the water.

Haze, which makes observation very difficult, often occurs on calm days in England when observation from the air would otherwise be easy.

It is always easier to observe when the sun is behind one than when one is looking into it.

Reconnaissance to obtain General Information about Country.

Very valuable information can frequently be obtained by an experienced observer, for instance, on the following points :—

(*a*) Country—whether it is flat, undulating or hilly with deep valleys.

(*b*) Roads—whether they are permanent or merely tracks.

(*c*) Rivers—breadth, quantity of water, whether country near is flooded. Bridges, standing or destroyed.

(*d*) Woods—size, thick or merely scattered trees.

(*e*) Cultivation.
(*f*) Railways—single or double lines, cuttings, embankments, tunnels, bridges, stations.
(*g*) Towns and villages—size, large buildings, open spaces, whether fortifications exist.
(*h*) Movements of large bodies of troops, camps. Sketches can also be made and photographs taken.

Reconnaissance to obtain Information as to Enemy's Position.

Information can probably be obtained on the following points :—

(*a*) Nature and position of the enemy's earthworks and trenches.
(*b*) Position of his guns.
  Groups of horses in hollows or behind trees point to the presence of guns.
(*c*) Features of the ground in front of the enemy's main position.
(*h*) Positions of his troops.

The information can either be noted on special maps ruled into half-inch squares, and showing the distinctive features which are most easily visible from above, or given by means of an eye sketch.

Negative information, *e.g.*, that a certain locality is unoccupied is of course often of great value.

A careful study of the map before ascending renders aerial reconnaissance far more rapid and accurate than would otherwise be the case.

Means of Communication between captive Balloon and Ground.

Communications between a captive balloon and the ground can be maintained by :—

(*a*) Telephone from the car to the balloon wagon. This is the method generally adopted.

(*b*) Megaphone. This is of no use in wind or when there is much noise on the ground.
(*c*) Signal flags. A method with many limitations.
(*d*) Sending down messages, sketches or photographic plates in small weighted bags, which slide down the cable into the wagon.

A field telegraph should be connected with the balloon wagon in order that information can be rapidly sent to the G.O.C. Orderlies and signallers are also indispensable.

READING TRACKS.

Difference between Tracks.

Since a large amount of information can be obtained from examining tracks, it is of great importance to the scout to be able to read them correctly. He should be able to tell at a glance the distinction between the tracks made by a man when running or walking, and by a horse when walking, trotting, cantering, or galloping, and he should, of course, be able to differentiate between the impressions made by the hind and fore feet. To illustrate this, Plates 1 to 7 (see pp. 91–97) have been prepared, and reference to them is recommended. Not only do the tracks made by different horses often vary to a considerable extent, but the tracks made by the same horses are also found to differ, more especially when they are being reined in. When judging tracks, allowance must therefore be made for this possible difference.

The tracks made by a led horse invariably incline towards those made by the ridden horse.

Points to Note.

When the nature of the tracks has been recognised, there remains the work of piecing together the narrative which they tell. To do this the following points, amongst others, must be noted :—

(1) Whether all the tracks run in one direction ;

(2) Whether there is any indication of the number of men or horses that have formed the tracks;

(3) Whether the tracks are quite recent, and if all are of apparently the same period. If there has recently been rain, it will help to determine the age of the tracks.

Among the various atmospheric conditions which tend to make tracks appear older than they really are, may be stated the following:—

(*a*) Sun; (*b*) Rain; (*c*) Heavy dew; (*d*) drying wind;

(4) Whether the whole party were moving at a uniform rate;

(5) Whether the tracks of any wheeled transport are visible, and if so, whether heavy or light. Whether there is any indication of their being those of guns;

(6) Whether any tracks of oxen are visible either on the main route, as if attached to wagons, or on one side of the track, as if they were being driven;

(7) The formation in which the force was moving or at all events that portion of it which was following the route on which the tracks are found;

(8) Whether any side tracks leave the main trail at any point; and if so, how many;

(9) Whether any halting places are visible; and if so, nature of the tracks in their vicinity, and whether the force has halted there for some time.

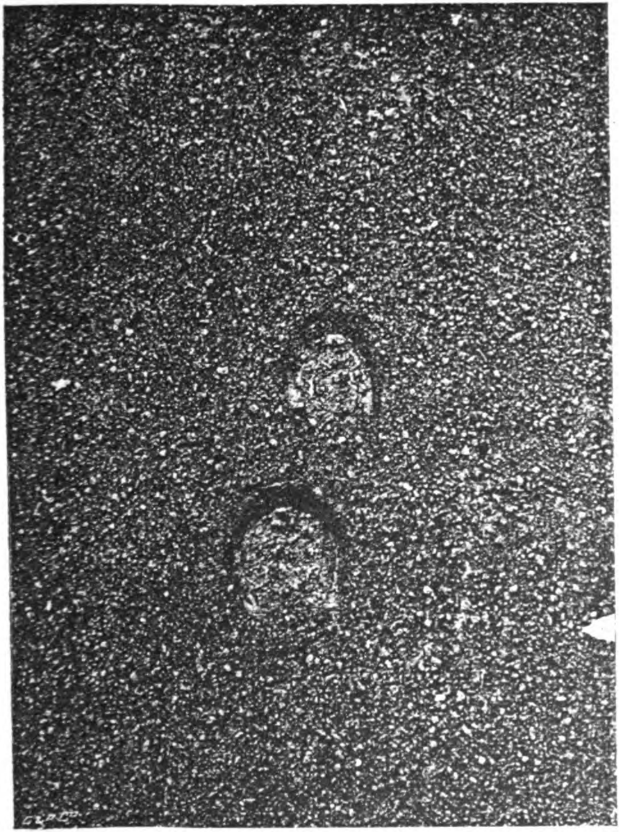
This inference may be drawn from the area over which the horses have been allowed to stray when feeding.

(10) Whether any camping places are visible; and if so, the nature of the encampment and the formation adopted for the camp;

(11) Whether there is any sign of food or other materials having been left behind, or whether there are still any oxen or sheep feeding in the neighbourhood, which would point to the force having a sufficiency of food.

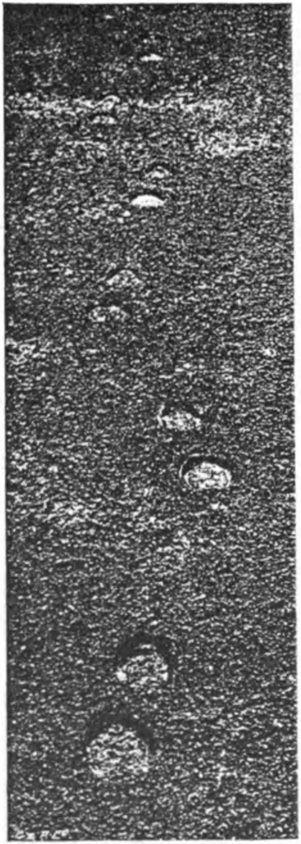
PHOTOGRAPHS BY A. MARTIN, LINGFIELD, SURREY.

Plate 1.



Fore Foot (bottom), Hind Foot (top).

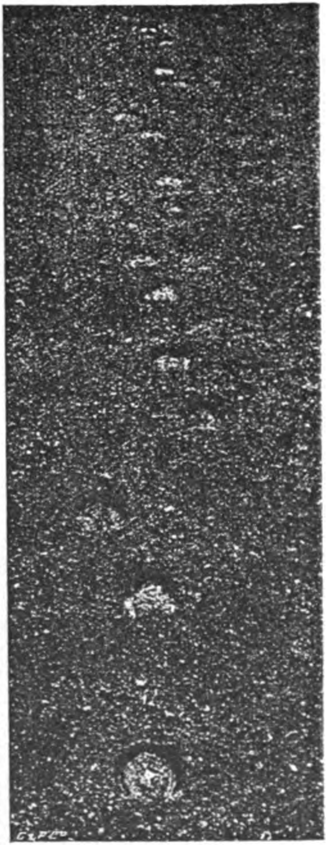
Plate 2, Fig. 1.



Horse Walking.

Distance from the toe of one fore foot to the heel of the other fore foot, 2 feet 8 inches.

Plate 2, Fig. 2.



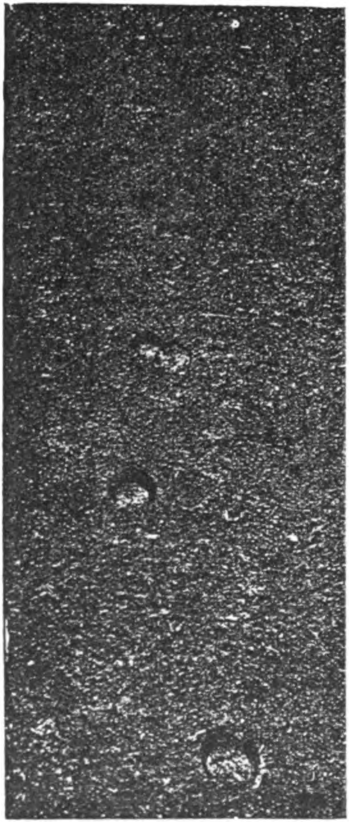
Horse Ambling.

Distance from the toe of one fore foot to the heel of the other fore foot, about 4 feet.

Horse Trotting.

Distance from the toe of one fore foot to the heel of the other fore foot, 4 feet 4 inches.

Plate 4, Fig. 1.



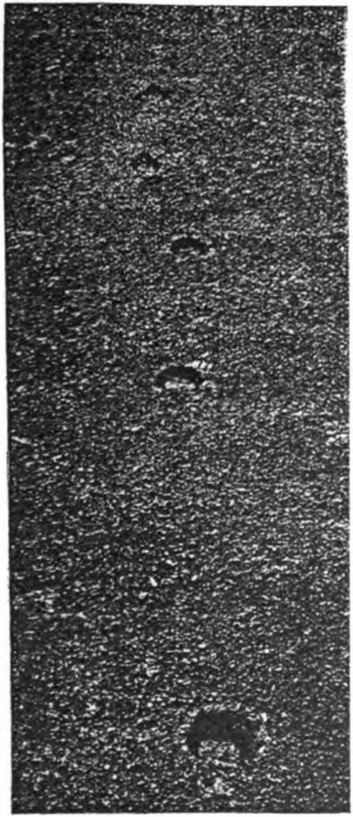
Horse Cantering Collected.

Plate 4, Fig. 2.

Horse Cantering Uncollected.

The distance from the toe of one fore foot to the heel of the other fore foot, as above, is 7 feet 4 inches.

Plate 5, Fig. 1.

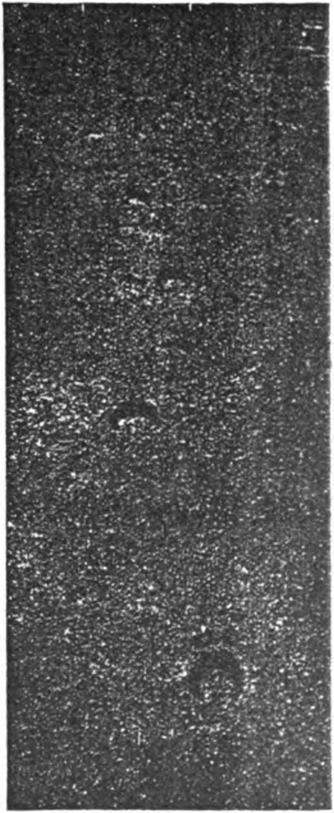


Horse at Full Gallop.

The hoof-marks are much deeper, especially at the toe, than when a horse has been cantering, or trotting.

The distance from the toe of one fore foot to the heel of the other fore foot, as above, is 10 feet 6 inches.

Plate 5, Fig. 2.

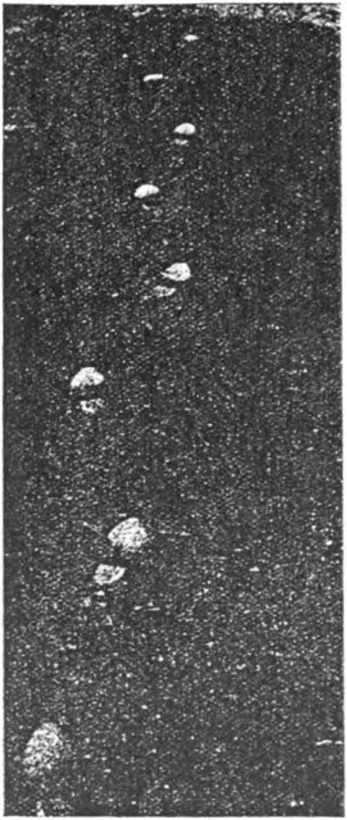


Horse Galloping (Slow).

The hoof marks are not quite so deep as when a horse is at full gallop.

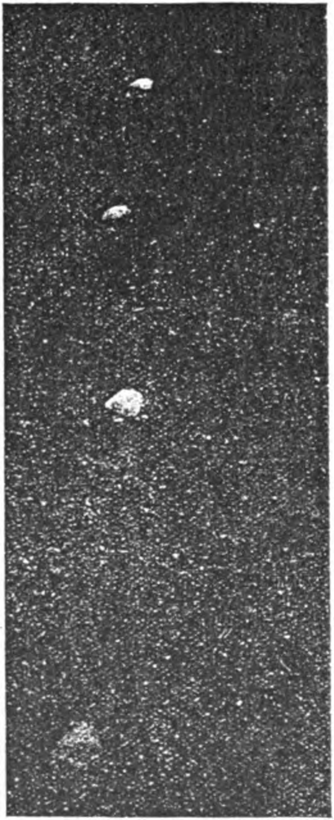
The distance from the toe of one fore foot to the heel of the other fore foot, is about 8 feet 6 inches.

Plate 6, Fig. 1.



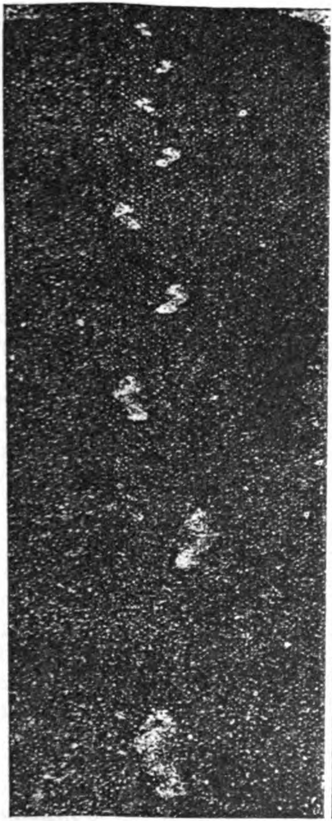
Man Walking in Boots.

Plate 6, Fig. 2.



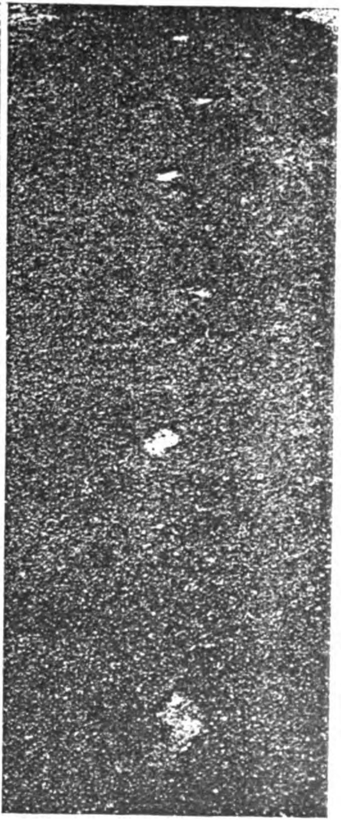
Man Running in Boots.

Plate 7, Fig. 1.



Man Walking in Bare Feet.

Plate 7, Fig. 2.



Man Running in Bare Feet.

Drawing Deductions.

As a scout answers each point he will find it convenient to note it down, and then piece the answers together, trying to form a narrative from the facts before him. This done, he should search for any further signs or tracks which would either support or contradict his deductions. If anything, he should be more careful to look out for any signs which go to refute any theory he may have formed.

If a Track is Lost.

If a scout loses a track, he should make a cast over the nearest ground which would be likely to show an impression, first choosing the line which he himself would have followed. If a track leads into a stream, he must not presume that it necessarily emerges on the other side, because it is quite likely that the person tracked may have entered the stream merely for the purpose of covering his tracks, and may have come out again some way up or down stream on the same side.

Corroborative Evidence.

When following horses or cattle, the manure will not only help to show from its position the pace at which they were travelling, but will also from its appearance give some indication of the time which has elapsed since the animals passed, due allowance being made for the effect of sun, rain, wind, and insects.

Necessity of Constant Practice.

To improve his power of tracking, every scout should take constant opportunities during peace time to follow up tracks on different kinds of ground, drawing inference from them, and when possible verifying any conclusions he may have drawn.

USE OF FIELD GLASSES AND TELESCOPE.

Field Glasses.

For successful reconnaissance, glasses of precision are practically a necessity. The best field glasses are Stereo Prism Binoculars. The particular advantages of these over the older pattern of prism binoculars are that they give more brilliant illumination, greater stereoscopic effect and better definition. These new binoculars are made in four powers, ranging from six to twelve diameters, *i.e.*, magnifying from 36 to 144 times respectively. Since light in field glasses is in many ways as important as magnifying power, and since the binoculars of six diameters obtain more light than glasses of higher power, these are, on the whole, probably the best power for general use, particularly if a high-power telescope is also carried. Excellent binoculars of this pattern are made by Ross Limited.

Telescopes.

The best telescope on the whole for military use is one of 20 diameters, with an object glass of 2⅛″. If a higher power is required, it may be obtained by adding to this a pancratic drawer with glasses of 25 and 30 diameters. By using this drawer a higher magnifying power is obtained, but at the expense of both light and field of vision. This high power will, however, be useful on a clear day for defining with greater exactitude objects which have been found when using the lower power. A very good telescope of this pattern is also made by Ross; it is better in aluminium than in brass, as it is much lighter. When mounted, it should be carried over the right shoulder, and strapped up tight, so that it is held in its place by the bridle arm when trotting.

Care of Field Glasses and Telescopes.

Always open and close tubes gently with a twisting motion. If wet, tubes should be thoroughly dried and oiled before closing. An instrument should never be taken to pieces unless absolutely necessary. If unavoidable, a towel or blanket should be spread between the knees to prevent risk of breakage. Each lens should be replaced at once when cleaned; two lenses should never be out at the same time.

Dust can be removed from a lens by a sharp puff of breath. If dirty or oily, methylated spirit should be used with chamois leather, selvyt cloth, or silk. Lenses must never be touched with the bare finger. The black from interior of the tubes must not be removed.

Method of using Field Glasses and Telescopes.

The following method of using the two glasses is recommended:—Whenever a fresh stretch of country opens before one, halt and sweep it with field glasses. If one notices any suspicious-looking object, or at any spot a different piece of colour to that which would be expected, or if the stretch of country is so extended as to make it impossible to define small objects in the far distance, hand one's horse over—unless he has been trained to stand still. Then creep forward to a favourable spot where it is possible, preferably, to sit down with one's back against something and knees up, holding the eye piece of the telescope with the right hand, and let the left hand, resting on the knee, hold the telescope lower down. This position is as steady as any other. If the ground is flat, and it is impossible to rest one's back against anything, lie down, support the head with the right hand, and, letting the telescope lie along the body, direct it with the left hand. If a stick is available, one can sit up, and use it as a support to the left hand. When sweeping the country with glasses, use the lowest power, since it gives a wider field, and work from right to left, or *vice versa*, at the same level; then, when the extreme right or left point which it is intended to work to has been reached, drop the glass to the level immediately below it, and work back again to the point directly below the point at which one started. Then drop the glass again to the next level and sweep back again, and so on. Seeing that it is convenient to work one hill face at a time, the length of each individual sweep should depend partly on the ground which is looked at, and partly on the length of sweep which can be conveniently covered without moving. If a single man only is actually seen, work the surrounding ground very carefully, because there will probably be others. To ascertain what the single man is doing, and what he is, use the highest power, if the atmosphere is favourable. The result of this may enable useful conclusions to be drawn, which must then, if possible, be verified.

FIELD REPORTS.

When a report is required on any district, railway, road, river, or position, the particular points to be dealt with must be carefully selected. These points can best be dealt with in a report under heads. In the absence of very explicit instructions, one must use one's discretion as to what heads to report upon. The heads mentioned below will, however, usually be required in each particular class of reconnaissance, although they may be added to or modified should it be necessary.

Field reports when sent in should always give the name of the officer or non-commissioned officer making the report, the place from which it is sent, the time and date. Any conclusion, which is merely the result of supposition or inference, should be so stated in order to distinguish it from that which is founded on observation.

All Field Reports should, if possible, be accompanied by a sketch on a scale of two inches to a mile.

1. Reconnaissance of Roads or Routes.

The points to note in such a report are:—

(1) ROADWAY.

(*a*) Whether metalled or not. If metalled, average width of metalled portion;

(*b*) If hedged or not, and if hedged, whether road is hidden from surrounding country; and if country on either side is suitable for marching;

(*c*) Whether level or hilly. If hilly, give approximate gradient of steep hills. (This must be estimated, unless one has a clinometer on one's sketching board).

(*d*) Condition, whether good or bad; especially noting the state on steep gradients and approaches to fords. Staff Officers prefer that places be noted where double or extra teams will have to be used to get wagons up bad places, so that they can make their arrangements beforehand. If the ordinary teams are in fair condition, heavy service wagons can ascend a gradient of 1 in 10 without extra teams. For a short distance, guns can be taken up gradients of 1 in 4. Sandy places, being troublesome for wheeled transport, should also be noted.

(2) BRIDGES.

1. Material; whether brick, stone, iron, or wood;
2. Construction; (*a*) whether arch, suspension, or girder; (*b*) description of parapet;
3. Dimensions; (*a*) length; (*b*) width; (*c*) height above water, road, or railway.
4. Capacity for heavy traffic, such as traction engines;
5. Whether material for repairs is at hand; if so, give cubic contents of the pile, which is found by multiplying the height, length, and breadth together in feet. If it is desired to find the number of cubic yards divide the result by 27.
6. Dimensions for demolition:—
   If masonry:
   - (*a*) Height from crown to roadway over the bridge;
   - (*b*) Thickness of piers (if any);
   - (*c*) Width of bridge;.

If suspension :

The minimum thickness of the main cables.

If straight girder :

(*a*) The dimensions of the main girders carrying the roadway ;

(*b*) The number and length of spans.

If arched girder :

(*a*) The dimensions of the girders at the haunch of the arch;

(*b*) The number and width of the arches.

For Reconnaissance for Supplies, see p. 125.

(3) WATER.

(*a*) Whence the supply is obtained, and nature of approaches. Whether there is a stream or pond near road from which a large number of horses can drink at a time ; if so, estimate what number ; if not, state largest source of supply, and whether buckets are required ;

(*b*) Quality. Water which is colourless and transparent, free from taste or smell, and deposits no sediment may be said to be *apparently* good.

(*c*) Supply, if limited or unlimited.

The average amount of water required by a man for drinking and cooking is one gallon a day, and, if it is available, two or three gallons for washing. Horses should be allowed about ten gallons a day.

To calculate the quantity of water which can be obtained from a stream in 24 hours, multiply in feet the width of the stream by the average depth, multiply that by the mean velocity (in feet per minute, multiplying this result by 9,000. The mean velocity is 4-5ths of the surface velocity. To calculate the surface velocity, throw a small piece of wood into the stream, noting how many feet it travels in a minute.

To take an instance :—

Width of stream 6 feet, average depth ½ foot, surface velocity 180 feet per minute, mean velocity = 144 feet. 6 × ½ × 144 × 9,000 = 3,888,000 gallons per 24 hours.

(4) TELEGRAPHS.

(*a*) If telegraph wires are carried along the road either on poles or in subterranean pipes ; and, if so, the number of wires, and whether in apparently good order. If the line is a subterranean one, test boxes —the positions of which are usually marked by a stone—are situated at approximately equal distances from one another along the road, say, every 100 yards or so. In war time it is possible that these stones may have been removed (see also p. 702). If the wires are cut, could they apparently be easily repaired ;

(*b*) If transmitting stations are apparently undamaged.

(5) NATURE OF COUNTRY IN VICINITY OF ROAD.

If any height commands the road, even at three miles distance, or up to as much as five miles where there is a likelihood of heavy artillery being encountered, its approximate position should be shown on the sketch.

2. Reconnaissance for a Night March.

(1) The general compass bearing of the route ;

(2) Road ;

(*a*) Whether metalled or not. If metalled, average width of metalled portion.

(*b*) Whether hedged or not, and whether any soft ground at side of road suitable for marching (*i.e.* to deaden the sound of troops marching).

(*c*) Whether level or hilly; maximum gradient of steep hills.

(*d*) Condition, whether surface good or bad ;

(3) Description of the route;
- (a) What prominent natural or other features are visible; the best means of recognising those at night; their compass bearing.
- (b) Whether any roads or tracks running parallel to the route to be taken by main body, which would be suitable for the flank guard.
- (c) Points where checks are likely to occur, and whether any special steps can be taken to prevent any delay.
- (d) Turnings in road, where the column could go astray, and best method of marking them, *e.g.* placing branches across them or lines of stones;

(4) Description of the point where march is to end, and how it may be recognised at night.

3. Reconnaissance of Defiles and Passes.

(1) Their length and breadth;
(2) The description of hills on either side;
(3) Description of exit from defile and country beyond, and whether exit is covered by artillery positions; if covered, whether these positions could be commanded from any point by the guns of one's own force.

Notes should be made in going through the defile, but reconsidered, and, if necessary, amended on the return journey, for the reason that one will then be looking at it from the other point of view.

4. Reconnaissance of a Coast for Defensive Purposes.

I. GENERAL DESCRIPTION OF THE WHOLE AREA UNDER REPORT.
- (a) General formation and lie of the ground;
- (b) Description and aspect of the country at different seasons;
- (c) Climate at different seasons.

II. List of Possible Landing Places.

Note—These should be obtained either from the Naval Authorities or in conjunction with them.

III. Description of each Landing Place.

Note.—Each of the landing places mentioned in II. must be reported on separately and under the following heads:

A. Position and Description.

(*a*) Whether landing place is in bay, inlet, or on open sea;
(*b*) Whether any, and, if so, what, winds would make landing there impossible;
(*c*) Prevailing winds at time of year when landing likely;
(*d*) Direction and strength of tides and currents;
(*e*) Distance of 5 fathom line from low water mark;
(*f*) Character of bottom for anchorage outside 5 fathom line;
(*g*) Whether any outlying banks which shelter the landing places at low water;
(*h*) Rise and fall of tide at ordinary and spring tides.

B. Facilities from Enemy's Standpoint:

(1) Shore.

(*a*) Whether rocks, shingle, or sand;
(*b*) Whether any groynes exist, on the lee side of which boats might safely approach shore;
(*c*) Slope of shore—
  (1) Between high and low water marks;
  (2) Above high water mark;
(*d*) Width of foreshore—
  (1) Between high and low water marks;
  (2) Between high water mark and any natural obstacle on shore side;
(*e*) Length of that portion of shore which is suitable for landing.

(2) PIERS.
- (*a*) Whether any temporary piers required for landing guns and transport;
- (*b*) Material available on shore;
- (*c*) Winches, hawsers, and ropes available.

(3) FORMING UP PLACES.
- (*a*) Position;
- (*b*) Extent;
- (*c*) How far protected from any ground from which artillery or machine gun fire could be brought to bear.

(4) COVERING FIRE FOR LANDING PARTY.
- (*a*) Whether the ships' guns could co-operate in covering the landing;
- (*b*) What ground would probably have to be occupied to cover the landing.

(5) TRANSPORT WITHIN, SAY, 5 MILES OF LANDING PLACE (OR FURTHER, IF POSSIBLE).

Number and Description of Transport vehicles and animals.

NOTE.—To save a detailed count, some general rule as to the number of each of the following in every 100 acres, or to every 100 inhabitants, can easily be arrived at, but the percentages will be found to differ in different kinds of country.

(6) SUPPLIES WITHIN, SAY, 5 MILES OF LANDING PLACE.

NOTE.—The source of supply and the average stock throughout the year should be given, unless they vary very much in any quarter, as they may do, particularly in the case of cattle, sheep, flour, and forage. (See also note under (5) above).

(*a*) FLOUR—
- (1) Flour, number of bushels;
- (2) Position of mills and their capacity in sacks per day;
- (3) Position of granaries. Description and quantity of contents;
- (4) Position and capacity of local bakeries.

(*b*) GROCERIES AND VEGETABLES—
- (1) Description and quantities.

(*c*) MEAT—
- (1) Number of cattle, sheep and pigs respectively ;
- (2) Position of cold storage (if any) and average stock ;
- (3) Preserved meat, number of lbs.

(*d*) FORAGE—
- (1) Hay, number of tons fit for immediate consumption ;
- (2) Oats, number of quarters ;
- (3) Barley, number of quarters.

(*e*) FUEL—

Nature of fuel, and whether good supply.
Petrol in gallons or litres.
Coal
Coke
Wood
Charcoal.
} Whether plentiful or otherwise.

(7) BILLETING ACCOMMODATION WITHIN, SAY, 5 MILES OF THE LANDING PLACE.

(*a*) For ordinary billets ; (*b*) For close billets.

NOTE.—For usual method of estimation, see pp. 124, 591. In the case of small cottages in villages, it may be calculated at the rate of so many men per kitchen fire.

C. FACILITIES FROM DEFENDERS' STANDPOINT :

(1) OBSERVATION :
- (*a*) Position of suitable observation and signalling stations ;
- (*b*) Extent of view from them.

(2) APPROACHES TO THE SHORE :
- (*a*) General nature of country within, say, 5 miles of shore further, if possible ;

- (*b*) Nature of approaches, roads, etc., to the coast from points at which troops would assemble, and how far they are protected or sheltered from view of ground which might be seized by a landing force;
- (*c*) Any important road centres which should be held.

(3) DEFENSIVE POSITIONS:

- (*a*) Artillery positions from which landing could be disturbed;
- (*b*) Artillery positions from which ground which would probably be held by the enemy's covering force might be shelled;
- (*c*) Suitable positions for infantry—
  - (1) Situation and extent of each position;
  - (2) Line of advance which each position if held would block;
  - (3) Natural strength of each position;
  - (4) Steps which should be immediately taken to strengthen each position.

(4) TELEGRAPH COMMUNICATIONS:

- (*a*) How far cutting of lines within, say, 5 miles of coast would interfere with communications to centres where troops are located;
- (*b*) Any important telegraphic centres to be protected;
- (*c*) Whether any underground lines exist.

(5) RAILWAYS:

- (*a*) Suitability of railways for transporting troops to threatened area;
- (*b*) Most suitable stations for detraining troops, 5 to 10 miles from possible landing place;
- (*c*) Any important bridges or tunnels to be guarded;
- (*d*) Nearest junctions or repair shops, where engines, etc., are likely to be found, and which would either have

to be protected or the rolling stock removed from them by the defenders to prevent it falling into the enemy's hands.

(6) Motor and Cycle Repair Shops within 7 Miles of Landing Place:
- (*a*) Position of shops and nature of repairs which can be executed, and whether petrol and illuminating oil obtainable.

(7) Demolitions:
- (*a*) Any demolitions which it would be advisable to effect in order to delay enemy's advance—
  - (1) Nature of demolition;
  - (2) Approximate amount of gun-cotton required.
- (*b*) Whether possible to cut off water supply from any district—
  - (1) Extent of area which would be affected;
  - (2) Method of cutting off supply.
- (*c*) Whether any large stores of food or forage which could be readily destroyed, if removal impossible—
  - (1) Situation and approximate amount of stores usually retained there;
  - (2) Best method of destruction.

(8) Engineer Stores and Materials:
- (1) Supplies of tools; axes, shovels, spades, pickaxes, crowbars, sacks for sandbags, iron dog nails, barbed and other wires; explosives; dynamite and gun-cotton;
- (2) Material; timber yards, foundries and forges.

(9) Removals:
- (*a*) Best method of arranging for immediate removal inland of the following, and the approximate proportion of each which could be removed at least 10 miles from the landing place after 2 hours' warning—

(1) Riding and transport animals; (2) Motor lorries, tractors; (3) Cattle, sheep; (4) Flour; (5) Groceries.

(10) BILLETING ACCOMMODATION within the belt of country lying between the 5th and 7th miles from the landing place, *i.e.* immediately outside the 5-mile area, which might be seized by enemy: (See note under B. 7, p. 109.)
(*a*) For ordinary billets; (*b*) For close billets.

5. Reconnaissance of a Coast for purposes of Landing.

NOTE.—A panoramic sketch showing the prominent features, particularly as they appear at night, when viewed from the proposed anchorage, should accompany this report.

(1) SEA—
See A. on p. 107.

(2) SHORE—
See B. (1)–(4) on pp. 107–108.

(3) PIERS—
See B. (2) on p. 108.

(4) BEACH PARTY—
(*a*) Suggested distribution of beach party.

(5) FORMING UP PLACES—(These should be shown on the map and numbered.)
See B. (3) on p. 108.

(6) COVERING FIRE—
See B. (4) on p. 108.

(7) APPROACHES INLAND—
(*a*) Nature of country.
(*b*) Nature of approaches, roads, etc., inland.
(*c*) To what extent these approaches are protected from any ground from which artillery fire could be brought to bear.
(*d*) Facilities for establishing communication and signalling between naval and military force acting in concert.

(8) ENEMY—
(*a*) Troops quartered in vicinity.
(*b*) What opposition is to be expected from these troops.

(9) TRANSPORT WITHIN, SAY, 5 MILES OF LANDING PLACE—
See B. (5) on p. 108.

(10) SUPPLIES AND ENGINEER STORES AND WATER—
See B. (6) on p. 108, and C. (8) on p. 111, and (3) on p. 104.

(11) BILLETING ACCOMMODATION—
See p. 124.

6. Reconnaissance of Rivers.

(1) GENERAL.
Width; depth; whether navigable, and whether tidal.

(2) BRIDGES.
(*Vide* Notes on Road Reconnaissance, see pp. 102–105).

(3) FORDS.
Their position, length, breadth, depth, nature of bottom, direction across stream, and approaches.

Note.—Fords are generally to be looked for above or below sharp bends, and they very often run diagonally across a river. Sometimes a good ford will lead to a shallow down the centre of a stream, which may have to be followed for some distance before it is possible to cross to the far bank. In following a track down to a stream, it must not be taken for granted that it leads to a ford, unless there is a corresponding track up the other bank. It may, for instance, be a track made by animals to the water on one side only. When unable to get close enough to a river to reconnoitre it for fords, it will be worth while to watch the enemy's patrols in the neighbourhood of the river as they may inadvertently disclose them, as the Spanish patrols did at Alvarez during the Peninsular War. Lord Wellington on a very important occasion guessed the existence of a ford from seeing two very small groups of houses opposite one another on different sides of a river.

When crossing a deep ford of a rapid river, it is best for infantry to hold each other's arms. When possible the limits of a ford should be marked by posts and ropes stretched between them on the down-stream side.

The depths usually considered passable in fords are as follows:—

	Rapid Stream.	Sluggish Stream.
Cavalry	48 inches.	56 inches.
Infantry	36 inches.	42 inches.
Guns and Wagons ..	30 inches.	30 inches.

A sluggish stream is a stream running not more than 1½ feet per second; a rapid stream is one running 5 feet per second. To determine the velocity of the stream throw a small stick in, and time it floating down a certain distance.

The best fords are those with a hard gravel bottom.

(4) THE BANKS.
  (*a*) Whether steep, shelving, marshy or firm.
  (*b*) Whether tow paths run along, and whether roads run down to the banks.

(5) BOATS AND FERRIES.
  (*a*) Whether available for men, horses, or transport, and, if so, the number of men and horses which could cross at one time. Whether there is any material for rafts.
  (*b*) Whether the approaches to the ferry and the facilities for loading boats or rafts are good.

(6) ISLANDS.
  (*a*) Whether passable.
  (*b*) Nature of cover on them.

(7) ARTIFICIAL BARRIERS.
  (*a*) Their position, and whether dams, weirs, locks, or sluices.

(*b*) Their construction, and the extent to which they regulate the river.

(8) FROZEN RIVERS.

If frozen, whether passable.

The following are the required thicknesses for different units: infantry in single file, 3½ inches; cavalry, 4½ inches; mountain artillery, 5¼ inches; field artillery, 6 inches; loads of any weight, 12 inches. Be certain that the ice is resting on the water.

7. Reconnaissance of a River Crossing.

(1) WHICH BANK COMMANDS THE OTHER.

(*a*) Which bank enemy is likely to hold.

(2) WHETHER CROSSING SUITABLE FOR FORD, BRIDGE, OR FERRY.

If suitable for Ford, note points stated on pp. 113–114.

If suitable for Bridging:

(*a*) Breadth of river;

(*b*) Depth along line proposed to be bridged;

(*c*) Strength of stream;

(*d*) Whether river liable to floods;

(*e*) Whether any existing facilities for bridge either in the way of existing bridge over portion of river, boats, or materials for construction of bridges. (*For material required for bridges, see* pp. 741–742.)

(*f*) Observations (if any) as to most suitable form of bridge (see pp. 738–740).

If suitable for Ferry:

(*a*) Breadth of river; (*b*) Strength of stream;

(*c*) Whether river liable to sudden floods;

(*d*) Whether there are any existing facilities for ferry either in the way of boats, in which case state whether they are available for men, horses, or transport, and if so, the number of men and horses which could cross at one time, or whether there is any material for rafts. (*For material required, see* pp. 798–800.)

(3) BANKS.

(*a*) Whether steep, shelving, marshy, or firm;

(*b*) Whether there are existing means of approach for men, horses and wagons down the banks to the proposed ford, bridge, or ferry, and if not, what steps would have to be taken to make approach suitable.

(4) ROADS.

(*a*) Whether there is any road leading to the *near* bank which could be used as an approach road to the ford, bridge, or ferry, and if not, whether a track could be made, and whether it would be passable in wet weather, or whether a rough road would have to be constructed, and if so, material available.

(*b*) The same points with regard to the *opposite* bank.

(5) TACTICAL CONSIDERATIONS.

(*a*) Whether ford, bridge, or ferry on convex or concave bend of the river;

(*b*) Whether either approach road, road on opposite bank or river crossing is likely to be exposed to enemy's artillery fire;

(*c*) Positions for artillery covering the crossing, and

(1) If the force is advancing, the extent of country on the opposite side of the river, which artillery on those positions could command, and whether the country is open, enclosed, cultivated, or wooded;

(2) If the force is retreating, the extent of country to the rear and on the flanks, which artillery on these positions could command, and whether country is open, enclosed, cultivated, or wooded.

(*d*) Positions which could, if desired, be held in order to cover flanks during crossing.

If the force is retreating:

(*e*) The position which the rear guard could take up in order to cover the crossing.

(6) NATURE OF COUNTRY ON OPPOSITE BANK.

(*a*) Whether nature of country on opposite bank is favourable to the advance of troops who cross first;

(*b*) Positions which they might take up to cover crossing of remainder of column.

8. Reconnaissance of Buildings for Attack or Defence.

The points to be noted in such a report are:—

1. Length, width, height, and general formation;
2. Nature of roof;
3. Materials used in construction;
4. Thickness of walls;
5. Whether there are any porches or large windows from which an enfilading fire along the front of the walls could be brought to bear;
6. Whether boarding and stones or any other materials are available for the defenders to barricade windows and doors;
7. Whether the building could be set on fire by the attackers;
8. Whether there is a clear field of fire from the building, and if not, whether the ground could be easily cleared;

9. Whether there are any outhouses or other buildings which could be used either in an attack or in a defence ;
10. Whether there is any high ground commanding the building ;
11. Water supply :
    (*a*) Where available ; (*b*) Whether limited or unlimited ; (*c*) quality.

9. Reconnaissance of Woods.

1. Their extent.
2. Whether trees are coniferous, such as firs ; deciduous, *i.e.*, such as drop their leaves during autumn ; or mixed ;
3. Whether passable by artillery, cavalry, and infantry ;
4. Whether there are paths or drives through the wood ;
5. Whether there is a clear field of fire round the edges of the wood ;
6. Nature of approach for an attacking force ;
7. Whether any water is available within the wood ;
8. Nature of boundaries, whether hedge, wire or wood fence, or ditches, etc.

10. Reconnaissance of Positions held by the Enemy.

1. The nature of the position, whether hill, plateau, fort, town, wood, etc.

2. The extent of the position, or, at all events, the extent of its front. *As to judging distance laterally*, see p. 338.

The front should be divided into sections, each section of a size which can be reported on by two or more officers and scouts. Whenever possible, a sketch map of each section or an enlargement of the existing map should be made, and the whole then joined together and completed. A panoramic sketch should, if possible, also be made. The following points should be reported on in each section :—

3. Any advanced posts which have been occupied in front of the real position. Give all information possible as to :—

(*a*) Strength in which they are held ;

(*b*) The principal fire position held by the enemy, and to what extent entrenched ;
(*c*) Gun, and especially machine gun, positions ;
(*d*) Obstacles ;
(*e*) Whether ground facilitates their being turned ;
(*f*) Most favourable line of advance ;
(*g*) Principal fire positions which could be occupied during advance ; and the approximate ranges from them to the principal fire position held by the enemy ;
(*h*) Description of cover available for all arms during attack on these positions and any dead ground within range ;
(*i*) Elevated ground in rear of firing line from which overhead fire could be opened ;
(*j*) Points from which covering artillery fire could be opened.

4. The line held by the main body and all information possible as to :—
(*a*) The principal fire positions held by the enemy, and to what extent entrenched ;
(*b*) Heavy, field and machine gun positions ;
(*c*) Obstacles ;
(*d*) Degree of reverse slopes of enemy's position ;
(*e*) Enemy's fire positions from which an oblique or converging fire can be delivered ;
(*f*) Most suitable lines of advance ;
(*g*) Principal fire positions which could be occupied during advance, and the approximate range from them to the principal fire position held by the enemy ;
(*h*) Description of cover available for all arms and any dead ground within close range ;
(*i*) Whether any elevated ground in rear of firing line from which overhead fire could be delivered ;
(*j*) Points from which converging artillery fire could be opened ;
(*k*) Whether ground in section is suitable for enemy's counter-attack, viz. whether ground is suitable for co-operation of all arms and counter-attack could be covered by artillery fire from main position ;

As regards the sections comprising the two flanks, information should in addition to 4 (*a*)–(*k*) be given as to :—
(*l*) Whether any points have been occupied beyond the flanks of the real position. If so, report on Points 3 (*a*)–(*j*) ;
(*m*) Nature of ground on which the enemy's flanks rest ;
(*n*) Whether ground on enemy's flanks suitable for co-operation of all arms.

5. The most vulnerable point in the position :—
   - (*a*) Reason for weakness ;
   - (*b*) Whether converging fire could be brought by enemy on ground in front of this point from other parts of the position ;
   - (*c*) Whether ground in front of this point suitable for combined action of all arms.

6. Any point the capture of which would exert a decisive influence on the issue of the fight :—
   - (*a*) Reason for stating so ;

If occupied, report on Points 3 (*a*)–(*j*) and
   - (*k*) At what range it is covered by fire from the main position.

7. Likely position of enemy's general reserve.
   Reasons for stating so.

11. Reconnaissance of the Enemy's Artillery during Battle.

When reconnoitring to find the enemy's artillery positions in action, the following points should be borne in mind :—

Batteries will very often be brought into prepared positions under cover of darkness, and then open fire at daybreak. Guns may occupy a false position to start with, and then, when they have drawn fire on it, move to their real positions. The fact of seeing epaulments does not necessarily mean that there are guns in them ; they may have been prepared merely to provide for possible changes of position. On soft sandy soil the position of guns may be given away by the dust which is thrown up at all events after the first shots. If guns are only just over a crest, the flash will nearly always be seen. If the flash is not seen, it will probably point to their being some way behind the crest. Guns may also be placed close up to standing crops in order to conceal the flash. Officers must not be deceived by contrivances which simulate flashes ; they were used in Manchuria. The immobility of dummy gun detachments in vacated epaulments should prevent any one being deceived by them. Ammunition may be brought up even considerable distances by hand, and thus no wagons or horses may be visible for some hundreds of yards from the actual position of the guns.

12. Reconnaissance for Night Attack.

A panoramic sketch should, if possible, be made of enemy's position from Position of Deployment, showing features as they will appear at night.

(1) ENEMY'S POSITION.
- (*a*) Nature of the position, whether hill or woods, etc.
- (*b*) Extent of the position, or, at all events, the extent of its front;
- (*c*) The distribution of his forces, so far as they are known.
- (*d*) Position of his outposts.
- (*e*) Position and nature of his entrenchments.
- (*f*) Whether any obstacles which would hinder advance and best method of surmounting or removing them.
- (*g*) Position of any landmarks which would assist the advance.

(2) POSITION OF ASSEMBLY.
- (*a*) Position and extent of the most suitable place for position of assembly.
- (*b*) How recognised when approached from the side farthest from the enemy.

(3) COUNTRY BETWEEN POSITIONS OF ASSEMBLY AND DEPLOYMENT.
- (*a*) Distance between places recommended for positions of assembly and deployment.
- (*b*) Nature of country.
- (*c*) Description of the route.

(4) POSITION OF DEPLOYMENT.
- (*a*) Position and nature of the place recommended for position of deployment.
- (*b*) How recognised when approached from side farthest from the enemy.

(5) COUNTRY BETWEEN POSITION OF DEPLOYMENT AND POINT TO BE ASSAULTED.

- (*a*) Distance between position of deployment and position to be assaulted and general compass bearing.
- (*b*) Nature of the country over which the assaulting troops will have to pass.
- (*c*) Whether any intermediate position which the troops could take up if attack fails.
- (*d*) Whether ground easy to entrench.

13. Reconnaissance of a Defensive Position.

1. The extent and depth of the position;
2. The best line to be held by the infantry;
3. Number of sections into which the position may be divided (see p. 231), and suggested boundaries for each;

And in respect of each section whether: (*a*) Nature of ground is such that section must be strongly held or may be lightly held; (*b*) Clear field of fire, and if not, generally as to clearings required; (*c*) Good cover for firing line, supports and local reserves; (*d*) Ground from which an enfilading fire could be brought to bear along front of section; (*e*) Any woods or other special tactical points; (*f*) Fire positions which enemy are likely to occupy and approximate ranges to them; (*g*) Water. In the case of flank sections, add also whether open ground to observe any outflanking movement.

4. Whether there is strong ground or any natural obstacle on which to rest the flanks; and if not, best means of protecting flanks;
5. The best positions for the artillery;
6. The probable lines of the enemy's advance;
7. The probable positions of the enemy's artillery, and range to them;
8. Any points the loss of which would exert a decisive influence on the issue of the fight;

9. The most favourable ground for decisive counter-attack (p. 246);
10. Ground suitable for general reserve (p. 241), and mounted troops;
11. Whether lateral communications within position require improvement; and if so, best method of doing so;
12. Suitable rallying position in event of retreat (p. 180), and whether there are good roads or tracks to it, and positions from which flanks could be guarded during retreat.

Whenever possible a sketch map of each section or an enlargement of the existing map should be made, and the whole then joined together and completed.

14. Reconnaissance of Camping Grounds.

(1) Accommodation available.

Regiment of Cavalry takes 5 acres or 161 yards by 150 yards.

Battery of Artillery takes 2⅗ acres or 75 yards by 150 yards.

Battalion of Infantry takes 2⅗ acres or 75 yards by 150 yards.

(For other units, see p. 578.)

(2) Position as regards—
- (*a*) Facilities for defence, see p. 576;
- (*b*) Economy of outposts, see p. 576;
- (*c*) Communication between site of camp and line of defence, see p. 576;
- (*d*) Screen from observation, see p. 576;
- (*e*) Actual site for camp, see p. 576;
- (*f*) Means of approach from line of march, see p. 577;

(3) Food and fodder supplies (for full particulars, see pp. 125, 126);

(4) Water supply (for full particulars, see p. [illegible]);

(5) Fuel supply (for full particulars, see p. 127);

(6) Situation for latrines, see pp. 610-612.

15. Reconnaissance of Billeting Accommodation.

1. GENERAL.

(*a*) Estimated population of the area in which it is proposed to billet troops.

(*b*) General economic condition of the population ;

(*c*) Attitude of the population—whether friendly or not.

NOTE.—It is generally calculated that, in a rich agricultural district, billets *without* subsistence can be provided at the rate of about 10 men per inhabitant ; and at the rate of 5 to 6 men per inhabitant in town and industrial districts. Billets *with* subsistence can be found for a week for a number equal to twice the total population.

If a detailed reconnaissance is required of any town, village, or area, the following more detailed heads may be used.

2. CHARACTER OF BILLETING ACCOMMODATION IN A GIVEN AREA.

(*a*) Whether in town, village, or scattered buildings ;

(*b*) What proportion of accommodation for the men is in inhabited buildings.

3. ACCOMMODATION.

The amount of accommodation in such buildings as large barns, though not in ordinary stables, should be estimated for either men or horses ;

(*a*) For ordinary billets ;

The allowance usually is as follows :

In rooms over 15′, but under 25′ wide, 2 men for every yard of length ;

In rooms 25′ wide and over, three men to every yard of length ;

The top floor is usually reserved for the inhabitants.

(*b*) For close billets ;

The allowance is approximately 1 man per every 2 square yards of floor space.

4. ACCOMMODATION FOR HORSES.

Where there are no stalls, 5′ of length should be allowed for every horse. If the building is over 24′ wide, the horses may be placed in two rows.

5. FOOD, WATER, AND FORAGE.

If these are to be reported on, see pp. 104, 108, 109, 125 & 127.

16. Reconnaissance for Supplies and Transport.

The sources of supply of any given article of food stuff should invariably be given. In any case, it should be stated whether a given locality or district is self-supporting or not.

When making a report on supplies, or important points in connection with them, the position can best be indicated by writing a number on a map to correspond with a number in the report, *e.g.*, the position of a stack of hay may be marked ⑯ on the map and in the report under heading of "Hay" the words "⑯ 10 tons" may be written.

The metric measure is given in case the reconnaissance is made in some country where the metric system is in use. For English Metric Equivalents, see p. 877.

1. FOOD.
    - (A) Bread.
        - (1) Wheaten bread, number of quartern loaves or kilos of bread.
        - (2) Rye bread, number of quartern loaves or kilos of bread.
        - (3) Position of Bakeries.
    - (B) Flour.
        - See (6) (*a*) on p. 108.
    - (C) Groceries.
        - See (6) (*b*) on p. 109.
    - (D) Meat.
        - (1) Fresh.

(*a*) Live.

Number of cattle or sheep, or, if necessary, pigs.

Unless fuller particulars are required, they may be roughly grouped under the heads of large, medium, or small beasts as judged by the standard of the country, but the estimated average dead weight of a beast of each class should be given.

(*b*) Dead.

Cattle, number of stone (8 lbs.) or kilos (2¼ lbs.) or tonnes (2204 lbs.).

Sheep, number of stone (8 lbs.) or kilos (2¼ lbs.), or tonnes (2204 lbs.).

Pigs, number of stone (8 lbs.) or kilos (2¼ lbs.), or tonnes (2204 lbs.).

Position of cold storage and capacity.

(2) Preserved.

Number of lbs. or kilos.

2. FORAGE.

(A) Hay.

(1) Old hay.

Number of loads or tons or milliers.

(2) New hay.

Number of loads or tons or milliers.

NOTE.—To calculate the number of tons in a rick, measure the rick *in yards* and use the following formula ; length × breadth × (height to eaves plus ½ height to roof.) If a hayrick, divide this by 12, if straw, by 17.

(B) Oats.

Number of quarters or hectolitres.

3. FUEL AND LIGHT.
   - (A) Dry wood or cut peat.
     Description and number of cubic feet or stere (wood only). As to number of cubic feet to the ton, see p. 649.
   - (B) Growing wood.
     If no dry fuel available, give approximate quantity.
   - (C) Coal.
     Description and number of tons or milliers.
   - (D) Coke.
     Number of chaldrons or hectolitres.
   - (E) Oil.
     Description and number of gallons or litres.
   - (F) Candles.
     Number of lbs. or kilos.

4. SUPPLY DEPOTS.
   - (1) Position of suitable sites, and roads leading to and from same.
   - (2) Area available.
   - (3) Existing facilities for:
     - (*a*) Storage.
     - (*b*) Office room.
     - (*c*) Docks or wharves.
     - (*d*) Railway sidings and stations.
     - (*e*) Lighting.

5. COLLECTING STATIONS FOR SUPPLIES.
   - (1) Short particulars as to system of municipal government.
   - (2) Short particulars as to position and powers of the police.
   - (3) General system of ownership of land in vicinity, and whether owned by large or small holders.

6. TRANSPORT.
   See (5) on p. 108.

7. REMOUNTS.
   - (A) Horses.
     - (1) Number suitable for cavalry or mounted rifles.
     - (2) Number suitable for artillery.
     - (3) Number suitable for transport.
       And in the case of (3) whether their harness, and particularly their collars, are available.
   - (B) Mules, donkeys, or other transport animals.
     Number available.
8. REPAIRING SHOPS.
   - (A) Blacksmiths.
     - (1) Number of forges which can be worked at once.
     - (2) Number of ready-made shoes in hand, distinguishing fore from hind.
     - (3) Whether any suitable small coal is obtainable.
   - (B) Wheelwrights.
     - (1) Number of spare wheels suitable for use.
     - (2) Facilities for other wagon repairs.
9. MOTOR WORKSHOPS.
   - (1) Whether part of a motor factory, or merely a repair shop for minor repairs.
   - (2) Number and description of motor vehicles normally undergoing manufacture or repair.
10. SUPPLIES FOR MECHANICAL TRANSPORT AND MOTORS.
    - (1) Fuel: coal, wood, and petrol; and generally as to water supply.
    - (2) Engineering shops; facilities for repairs.

17. Reconnaissance of Railways.

If a thorough reconnaissance is required, the following are the main points with which it will be necessary to deal; but if a less detailed reconnaissance is required, the person furnishing the report will merely choose those heads to which he is specially instructed to direct his attention, or which appear to apply particularly to the purpose in hand.

The report on a railway is here divided into four main heads: firstly, a report on a section between two junctions or termini dealing only with those points which apply to the whole section; secondly, a report on each station in that section; thirdly, a report on the line between two stations; and fourthly, a report on the seaport terminus, if any, of the line.

(A) SECTION between and Stations Miles.

(This will cover the whole of a section between two junctions or termini).

Construction of line.

(1) Number of Through Running Lines, including "Goods" running lines which could be used for troop trains in case of emergency. If any portion is a single line, give position and length of crossing loops, and describe system of working, whether electric train staff or otherwise.
If any portion of the line is worked by electricity, give the position of generating stations or power-houses.
(2) Gauge;
(3) Rails: description and weight;
(4) How fastened: chairs or spikes;
(5) Treenails, length and diameter;
(6) Steel keys;
(7) Whether chairplates used;
(8) Angles of main line turnouts;
(9) Sleepers: (*a*) material; (*b*) whether laid transversely or longitudinally;
(10) Ballast, nature of, depth, and condition;
(11) General state of repair;
(12) Height and width in the clear in tunnels and under bridges;
(13) Give particulars of restrictions, if any, bearing on the question of weight or character of troop trains;
(14) Position of water troughs, if any;
(15) Position of any locomotive or carriage constructing or repairing shops or "stabling" depots

Signalling.

(1) How worked;
(2) If on block system, state which cabins possess through switches, so that it may be possible to extend sections in case of shortage of staff.
(3) Whether any hand signals are used, and if so, what signals.

Telegraphs and Telephones.

(1) Overhead or Subterranean;
(2) Whether carried through or over tunnels;
(3) Whether on Wooden Poles;
(4) Number of wires;
(5) State of repair;
(6) Repairing Materials;
(7) Whether telephonic communication between signal boxes:
(8) Where Railway "Linemen" are stationed.

(B) STATION. (NAME).

Mileage from previous station included in report.

Staff.

(1) Approximate number; showing Drivers and Guards separately, and what roads they know.
(2) Minimum number required for each shift at Signal Cabins in Station, and outlying cabins under the control of this station.

Accommodation.

(1) Nature of Approaches suitable for entraining Troops.
(2) Any Gates or Railings to be removed to facilitate the movements of troops, etc.
(3) Platforms—
    (*a*) Position;
    (*b*) Length;
    (*c*) Breadth;
    (*d*) Height above rails;
    (*e*) Means (if any) for loading or unloading:
        i. Horses;

ii. Guns;
iii. Wagons.

(*f*) Whether platforms could be lengthened; and
(*g*) Means available for doing this.

(4) Water—
(*a*) Number and capacity of storage tanks;
(*b*) Means of watering Engines;
(*c*) Whether water supply easily cut;
(*d*) Whether drinking water is available.

(5) Whether there are cross-over roads for shunting;
(6) Extent of Sidings; giving approximate number of trucks they will hold;
(7) Turntables;
(8) Cranes: (*a*) Capacity; (*b*) Whether fixed or movable;
(9) Engine sheds;
(10) Means of lighting platforms and shunting yards at night;
(11) Goods Sheds or Storehouses in or adjoining Station. Floor area in square feet.

Rolling-stock and Horses in Stations.

(1) Locomotives:
Description: (*a*) Passenger; (*b*) Goods.
(2) Rail Motor Cars and Trailers and carrying capacity.
(3) Carriages and Trucks.
Carrying Capacity for—
(*a*) Troops;
(*b*) Horses;
(*c*) Guns;
(*d*) Wagons.
(4) Road motor cars and carrying capacity.
(5) Road Lorries (good and parcels) and carrying capacity.
(6) Repairing facilities.
(7) Cranes on trucks and other material for use by break-down gangs.
(8) Number of Railway Horses stabled in precincts of station.

Coal Supply.

Stores.

(1) Spare (*a*) Sleepers; (*b*) heavy timbers for use under cross-over roads and entrance to sidings.
(2) ,, Rails: Ordinary and short lengths;
(3) ,, Chairs: Single and double;
(4) ,, Fishplates;
(5) ,, Bolts;
(6) ,, Keys and treenails;
(7) ,, Points and diamond crossings;
(8) Tools;
(9) Oil.
(10) Re-railing Jacks and Ramps;
(11) Flare lights;
(12) Loading Boards to facilitate end-loading of vehicles, guns, etc.

Telegraphs and Telephones—

(1) Number of Instruments and Transmitting Stations, and describe the system;
(2) State of Repair;
(3) What Telephone Instruments available and where.

(C) INTERMEDIATE BETWEEN and Stations, Miles.

(1) Tunnels—
  (*a*) Situation;
  (*b*) Length;
  (*c*) Height;
  (*d*) Nature of Soil;
  (*e*) Best means of Defence at
    i. end.
    ii. end.
    iii. outside ventilating shafts.
(2) Important Bridges—
  (*a*) Situation;

- (*b*) Whether (*a*) Bridge carrying Railway, or (*b*) Bridge over Railway;
- (*c*) Construction;
- (*d*) Materials;
- (*e*) Measurements essential for demolition;
- (*f*) Best means of demolition, and — lbs .of Guncotton required;
- (*g*) Best means of Defence.
- (*h*) Whether local conditions are such that if bridge damaged, reconstruction would cause much delay.

(3) Important Cuttings—
- (*a*) Position;
- (*b*) Length;
- (*c*) Maximum depth.

(4) Important embankments—
- (*a*) Position;
- (*b*) Length;
- (*c*) Maximum height;
- (*d*) Whether curve on embankment suitable for demolitions.

(5) Sidings (including those privately owned)—
- (*a*) Extent, giving approximate number of trucks they will hold.
- (*b*) Whether communicating with up and down line.

(6) Cross-over Roads—
Position.

(7) Level and Occupation Crossings, giving position.

(8) Catch Points—
Position.

(9) Maximum gradients—
- (*a*) Position;
- (*b*) Gradient 1 in —
All gradients steeper than 1 in 100 should be noted.

(10) Curves—
  (*a*) Position ;
  (*b*) Radius.   yards. (See p. 135.) All curves with a radius of less than 300 yards should be noted.

(11) Stores—
  (*a*) Position ;
  (*b*) Spare Sleepers ;
  (*c*) „ Heavy timbers, for use under cross-over roads and entrance to sidings ;
  (*d*) „ Rails : Ordinary and short lengths ;
  (*e*) „ Chairs : Single and double ;
  (*f*) „ Fishplates ;
  (*g*) „ Bolts ;
  (*h*) „ Keys and treenails ;
  (*i*) „ Points and diamond crossings ;
  (*j*) Tools ;
  (*k*) Oil.
  (*l*) Re-railing Jacks and Ramps ;
  (*m*) Flare lights ;
  (*n*) Loading Boards to facilitate end-loading of vehicles, guns, etc.

(12) Signal Cabins—
  (*a*) Position ;
  (*b*) Number of Men employed.

(13) General Remarks (if any).

(D) SEAPORT TERMINUS.

(1) Wharfage accommodation—
(*a*) With railway track along it ;
  (*b*) Without railway track along it ;
  (*c*) Number and capacity of cranes and whether travelling or fixed ;
  (*d*) Largest draught of ships which can be accommodated at wharves at all states of the tide ;

(*e*) Extent of rise and fall of tide.

(2) Pier Accommodation—
- (*a*) With railway track along it;
- (*b*) Without railway track along it;
- (*e*) Number and capacity of cranes, and whether travelling or fixed;
- (*d*) Largest draught of ships which can be accommodated at pier at all states of tide;
- (*e*) Extent of rise and fall of tide.

(3) Lighters—
- (*a*) Whether lighters are necessary;
- (*b*) Number of lighters and their carrying capacity;
- (*c*) Cubic capacity of largest package which the lighters can take.

(4) Storage Accommodation—
- (*a*) Extent in square feet;
- (*b*) Whether suitable for housing troops temporarily.

Rough Method of Determining Radius of a Railway Curve.

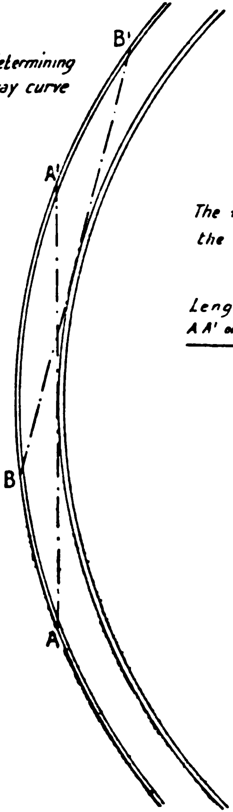
In order to find roughly the radius of a curve on a railway, take any point A or B (see Diagram 5, p. 136), on the outer rail of the curve, mark it with a stick, and march straight across so that the line touches the inner rail and is prolonged until it touches the outer rail again, such as AA′ or BB′ etc. Now pace this length AA′ or BB′ and use the formula—

$r = \frac{y^2}{8x}$ yards where r = radius of curve to be found in yards;
y = distance paced, AA′ or BB′ in yards;
x = gauge of line in yards.
(Note 4′ 8½″ = 1·57 yards.)

Any curve on a 4′ 8½″ railway in which the line AA′ or BB′ is less than 60 yards should be noted.

DIAGRAM 5.

Rough method of determining radius of a railway curve



The following Table shews roughly the radius of certain Curves:—

Length of Line A A' or B B' in yards	Approximate radius of Curve in yards
60	286
55	240
50	199
45	161
40	127
35	97

TRANSMISSION OF INFORMATION.

Methods of Transmitting Information.

Information may be transmitted :—

(1) By despatch riders mounted either on horses or bicycles or carried in motor-cars.
(2) By homing pigeons.
(3) By telegraph or telephone.
(4) By visual signalling.
(5) By wireless telegraphy.
(6) By aeroplanes.

1, By Despatch Riders.

Two methods of carrying Despatches.

Despatches are carried either by one man throughout the whole distance, or by relays of men, however mounted or carried, waiting at a known, or approximately known, point or points.

1.—*Despatches Carried by One Man.*

If undertaken by one man, no special organisation is necessary. The despatch rider should ascertain, as far as is possible, the direction or movements of the force to whom he is conveying his despatch. He must then work by map, and, if necessary, by compass, and proceed at the speed indicated on the despatch. He should always know the contents of the despatch. Should the despatch be his own, he will, of course, regulate his pace according to the importance of the message, and the urgency for its early communication to the person for whom it is intended.

2.—*Despatches Carried by Relays of Men.*

Where the change of despatch riders is effected merely by the handing over of the despatch to some other mounted men with directions to proceed with it, no special organisation is necessary. But where relays of riders have to be provided special organisation is necessary to effect beforehand the formation of fixed or moving posts.

Duties of Relay Posts.

A fixed or moving post is usually under the command of a non-commissioned officer, who will be responsible for the following points:—

1. The correct position, and, if necessary, the concealment of his post;
2. The defence of his post, unless there should be a piquet particularly detailed for the purpose, as might be the case where the inhabitants were unfriendly. In the German Field Service Regulations it is pointed out that in such cases, special precautionary methods may have to be taken, either by threatening whole parishes with punishment or taking hostages;
3. The correct entry in a register of every message received and despatched. Where sealed, the entry should merely show:—
   - (*a*) The name of sender of despatch, and place from which sent;
   - (*b*) Date and time of despatch by sender;
   - (*c*) Name and number of despatch rider bringing it in;
   - (*d*) Date and time of receipt;
   - (*e*) Name of person to whom despatched, and place to which addressed;
   - (*f*) Time of despatch from post;
   - (*g*) Name and number of despatch rider taking it out;
   - (*h*) The pace at which he was directed to travel.

   Where not sealed, the despatch should be read and a copy taken, but in the event of the capture of the post being threatened all copies and registers should be destroyed. The noting of these particulars must under no circumstances be allowed to delay the transmission of the message.
4. That the latest information is given to the despatch rider leaving his post;

DIAGRAM 6.

RELAY POSTS

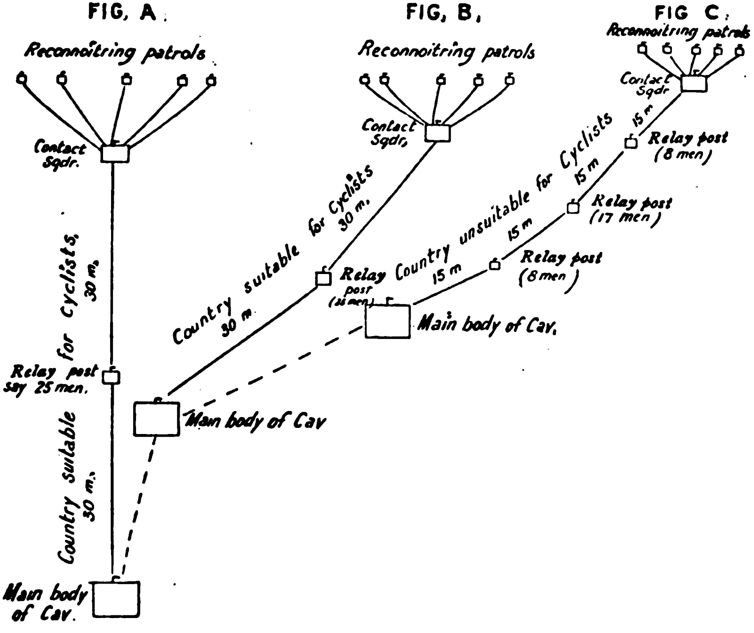


FIG. A.
Reconnoitring patrols
Contact Sqdr.
Country suitable for Cyclists, 30 m.
Country suitable for Cyclists 30 m.
Relay post say 25 men.
Main body of Cav.
FIG. B.
Reconnoitring patrols
Contact Sqdr.
Country suitable for Cyclists 30 m.
Country 30 m.
Relay post (25 men)
Main body of Cav
FIG. C.
Reconnoitring patrols
Contact Sqdr
15 m
Relay post (8 men)
15 m
Relay post (17 men)
15 m
Relay post (8 men)
Country unsuitable for Cyclists
15 m
Main body of Cav.

5. The regular supply of despatch riders, so far as he is able to regulate it, by giving them instructions as to the time of their return, with a view to their being available for further duty ;
6. The supply of such information as is at his command to all officers demanding it, and to such non-commissioned officers in command of bodies as it may appear to him advisable to inform ;
7. To tell off men for duty, and to see that the next man is always ready to start off immediately a message comes in ;
8. To question minutely all riders arriving at his post as to the information which they have ;
9. Wherever the ground is suitable, to place during the daylight a look-out man on some prominent point within hail to direct any riders coming to the post, and to give warning to the next man to be ready.
10. Not to detain at his post more than his complement of riders, unless there is some tactical reason for it.
11. To arrange for the best possible attention being given to the horses.

2. By Homing Pigeons.

Messages which may be suitably sent by this Means.

Apart from messages sent by beleaguered garrisons, for which pigeons are particularly suitable, those relating to matters of strategic importance can well be sent by this method though it will always be advisable to send duplicate messages of any importance by some other means. Even when sent by men engaged by tactical reconnaissance, information relating for instance, to the position of the enemy's reserves, the line of advance of a column with which our troops are not yet in close touch or any information sent from within the enemy's lines may well be transmitted by means of pigeons. The test, of course, is whether the time occupied in the flight, say at 1,000 yards per minute, and in the transmission of the message by telegram from the homing station is quicker than sending it by other means. There are, on the other hand, occasions when it may be safer, even though they take longer, to send a message by pigeons rather than despatch riders.

There is, however, little doubt that if the system is worked carefully and the birds well chosen, it forms, at least, a very convenient means of sending a duplicate message particularly to headquarters.

Choice of Pigeons.

The success of the system obviously depends on the careful selection of the pigeons to be used. Experience has proved that too much time and trouble cannot be given to the choice of birds to be used for carrying messages of supreme importance, which it may not be possible to duplicate within a given time in any other way.

In choosing birds, the chief points to which attention should be given are:—

(1) The birds should be of mature age, *i.e.* not less than 18 months old.

(2) The birds should not have been less than 3 months at the homing station which is to be used. The more training they have, especially over the ground across which they are to be flown, the better.

(3) They should all have been well trained and flown in races, proof of which can be given if necessary by the certificates which are always issued to winning birds. The fact of birds having won prizes in races may, generally speaking, be accepted as evidence that they have been sufficiently trained. Care must, of course, be taken to identify the actual bird with that referred to in the certificate. This is easily seen, in the case

of English birds, by comparing the number on the bird's metal ring with that mentioned on the certificate.

The best birds should be marked in some way, so that the most important messages may be entrusted to them. Birds of two or three years old are the most reliable, that is to say, birds that have been trained as young birds, again as one-year birds, and also in the following season. The more experience they have had, the more reliable will they be for distances up to 50 and 100 miles.

Conveyance of the Birds.

The best means of conveying birds is in large and airy wicker baskets holding half a dozen. These baskets can be made quite suitable for carrying on a bicycle. Smaller baskets may be made to hold, say, 4 birds, and ones to hold two will be found very useful. For mounted men, a small but airy wicker basket may be used and carried on the shoulders by two straps under the arm-pits somewhat like a knapsack. The German and French armies have special carriers for the purpose which are very simple and ride well with the birds in them. The birds must not be cramped, and the greatest care must be taken that neither their wings nor their tail feathers become fouled or injured, since this will very seriously interfere with their flying powers.

Assuming that there are apertures through which they can be fed and watered, the birds can be kept in small baskets for 48 hours, but a pigeon should not be kept in a small basket which has no apertures nor in a haversack even with air holes for longer than 12 hours at a time. Fresh air is most essential; all baskets, therefore, should be well ventilated. An exhausted pigeon cannot do its work.

Feeding and Watering the Birds.

Water to a pigeon is more essential than food. If a bird is kept without water for 12 hours, there is a considerable risk of its descending during its flight in order to get water.

Pigeons should always be fed with the best seed. Some fanciers do not feed their birds for as long as a day before a race in order to make them the keener to reach their homes, and when they have reached it to enter the trap at once. The best food to use whilst on service consists of good maple peas, a little canary seed occasionally, and a little rice. Whilst it should not be fed too liberally, a pigeon wants enough to stave off exhaustion.

Method of Despatching Messages.

Messages should be written on very thin and strong paper, folded so that it is about 2 inches long by $\frac{1}{8}$ inch wide, and passed through the ring on the bird's leg, one end bent over and an elastic band passed round the two ends to keep them together. If there is no ring on the bird's leg, another elastic band should be used in its place.

The bird should, if possible, be let loose at some distance from any firing, since it is very much better that it should have gained its bearings before it is frightened by the sound of firing.

Birds will not, of course, fly after dark or in the advanced twilight, and should therefore always be liberated in good time to reach their homing station during daylight, otherwise they will roost and only continue their flight next day. If used early in the morning, when they will generally render the best service, they should not be fed before liberation. If great distances have to be traversed, this may be unavoidable, but it must always be borne in mind that the longer a bird is on its journey, the greater is the risk of its being killed by a hawk or falling a victim to some other destroyer.

Important messages should obviously be sent in duplicate or triplicate. The greater the distance to be traversed the more necessary it is for safety to duplicate the messages, more especially so if the weather is at all bad.

Speed.

For journeys up to 50 miles, one thousand yards per minute may be taken as a fair average for birds such as have been recommended. For longer journeys, 30 miles per hour may be calculated. The wind, however, is an important factor. With a strong head wind the speed of the pigeon will be reduced to 800 yards per minute, with a side wind it will be about 1,000 yards, but with a tail wind it should easily reach 1300 or 1400 yards per minute.

Thick mist or fog or thunderstorms may very seriously delay a bird's progress.

Heavy rain will reduce a bird's speed, as they will go to ground until it has passed over their heads.

Arrangements at Homing Station.

Arrangements must, of course, be made for a soldier to be on constant watch during daylight at each loft. A person experienced with pigeons should also be present in case any birds settle down close to the loft and refuse to come into the trap. The soldier can make the necessary arrangements for preventing the fraudulent substitution of any message for that actually received, and can despatch the message itself by telegram or other means to headquarters.

3. Transmission of Information by Telegraph, etc.

The organisation of signalling stations and the transmission of messages by telegraph, telephone, wireless telegraph, or visual signalling is outside the scope of this work.

For Morse and Semaphore Codes, etc., see pp. 858–865.

4. Transmission of Information by Aeroplanes.

See pp. 85–87.

PART IV.

THE BATTLE.

General Principles.

A Great Battle.

A great modern battle, which may extend over a front of 100 miles or more and last for many days, is made up of a series of daily engagements of varying intensity, followed often by night operations in some portions of the field. In some of these engagements the commander may fight an offensive and in others a defensive action. There are strong, and often protracted attacks in different positions forming part of the line, followed by counter-attacks—which may themselves be met by launching fresh troops from the reserve. Each engagement is of course intimately connected with that on either flank, for the advance of one body may outflank a position which the force directly attacking it has been unable to carry, and so enable that force to advance; conversely the inability of any portion of the army to hold its ground may not only compel the force on its flank to fall back, but may nullify an advantage gained in some other portion of the field. The success or failure of any force to carry out the task allotted to it most probably has an effect far beyond the vicinity in which the engagement itself is fought.

In the following pages there will be considered under the head of "Attack," firstly, the action of that force which take the initiative; and secondly, that of the force which in the first instance postpones the assumption of the offensive and awaits attack; while the methods of delaying an enemy, without seeking a decisive result, are considered under the head "A Delaying Action."

The Offensive and Defensive in Battle.

Both opposing commanders may try to seize the initiative, or one may await the attack of the other, either because he is inferior in some respect, or because he may see his way, owing perhaps to have chosen and occupied a position, to gain a decisive success by, in the first instance, not taking the offensive. But a defensive attitude must, it is laid down, only be assumed in order either to await or to create a favourable opportunity for offensive action of a decisive character.

Advantages of Assuming the Offensive.

Offensive action has always a great pull over defensive action, in that it gives the attacker the great moral and material advantage of taking and retaining the initiative. It puts him in the position of being able to manœuvre; it enables him to screen to the last the particular force which is to strike the main blow at the enemy's position, and, moreover, allows him to strike at the time and place which he thinks best. Besides that, the only way to obtain a decisive success is by a vigorous offensive.

Stonewall Jackson once said:—"A small force can only successfully cope with a larger one by displaying greater activity. To await attack is to allow the enemy to choose his own time and place, and to surrender the advantage of the position. Numbers are of less consequence than the men's own confidence in their ability to conquer."

A commander will not necessarily limit himself wholly to offensive or defensive action, but may, as has been said, in one part of the field fight an offensive, while in another part he fights a defensive action. He will resort to the offensive where he wishes to force a decision, and to the defensive where he wishes to delay it.

It is pointed out that once battle is joined, the liberty of manœuvre which the offensive has conferred on the assailant is limited to the use of his general reserves. A commander who has assumed the defensive has a similar liberty, provided that he has made skilful dispositions, does not subordinate his movements to those of the enemy, and strikes at the first available opportunity. But in the difficulty of doing this lies the weakness of the defensive.

Manœuvring an Enemy out of a Position.

To manœuvre an enemy out of a position is to a great extent only a temporary measure, and if a decisive victory is to be gained it must be by compelling him to accept battle under as disadvantageous conditions as possible, and not merely by manœuvring him back towards his base.

The General Advance.

It is stated that when the commander decides to accept battle, the columns will be directed, whilst still in their march formations, towards the area in which they are to act. They will not, as a general rule, leave their march formations until the commander has formed his plan of battle, or until the action of the advanced troops shows that deployment is necessary.

The commander who intends to take the initiative will strive to obtain a superiority of fire with a view to the delivery of a decisive blow. To gain this, he may, if in decidedly larger numbers than his opponent, endeavour to envelop one or both of the enemy's flanks either by continuously extending his line until one of the flanks is overlapping, or by a converging movement timed to bring both wings of his force simultaneously on to the battlefield. In neither of these cases will it, as a general rule, be possible for a commander to retain a large force in hand after he has issued his orders, and consequently once the battle is joined he will have but little control over the situation.

A commander may, on the other hand, retain a large reserve in hand, with which he can take advantage of the enemy's mistakes, and strike a decisive blow at the time and place which he considers most suitable. This method, it is stated, is the one most suited to our own army, and is therefore the one chiefly considered in many of its details in the following pages.

Co-operation of Large and Small Bodies.

In whatever work they may be engaged on in action, it must, at all times, be the object of those in command of bodies of men, however small, without surrendering their initiative, to co-operate with other bodies in their immediate vicinity. It is by this intimate co-operation of small with large bodies throughout the whole force that the commander's orders are most effectively carried out and the grand end attained. This has been strikingly illustrated by the Japanese in the war with Russia.

CAVALRY ATTACK.

[In the case of Australia, read " Light Horse " for " Cavalry," and omit paragraphs relating to shock tactics. This omission applies also to the Yeomanry and to Mounted Rifles in India, New Zealand, and South Africa, and to Cavalry and Mounted Rifles in Canada.]

I. Division of the Cavalry on Active Service.

Cavalry and mounted troops on active service will be divided into three distinct bodies :—

1. Independent or Strategical Cavalry.
2. Protective Cavalry.
3. Divisional Cavalry.

Distribution.

Since great results can only be obtained from the employment of large numbers, the greatest possible force of cavalry will be employed in securing strategical independence, leaving for other purposes such number only as is absolutely necessary.

Duties of Independent Cavalry.

The independent cavalry will, in the first instance at all events, be entirely independent of the infantry divisions advancing behind them. They will be under the sole orders of their own commander, who will receive his instructions direct from the commander-in-chief. The independent cavalry will be the chief means of providing the commander-in-chief with the information which he requires in order to dispose the whole of his force to the best advantage and with the greatest hope of success.

Their duties will be :—

1. To ascertain the strength, direction of march, extent of front and depth of the enemy's columns, and with this end in view :—

(*a*) To defeat and drive in the enemy's independent cavalry.

(*b*) Subsequently to penetrate his protective cavalry, reinforced though they may be by some of the independent cavalry who have fallen back.

2. When this has been done, to harass the march of the enemy's columns by threatened attacks, thus causing them to halt and make dispositions for defence which will occupy time; and time, enabling the opposing infantry columns (as it probably does) to gain more ground, may be of the greatest consequence. To the independent cavalry the duty of raiding the enemy's communications or seizing important strategical points may also be assigned. If the enemy's cavalry have not been met with in the forward movement, the independent cavalry may have to expose and hamper the enemy's columns rather than seek out the enemy's cavalry.
3. As the action develops, cavalry *may*, by supporting their own infantry by dismounted fire, be usefully employed to deceive the enemy. They will also concentrate in readiness when the ground is suitable and they have scope for action, probably on the flanks. Cavalry on the flank of an army are obviously in a good position to take up a parallel pursuit or to attempt to divert the enemy from his principal line of retreat, thus enabling the main body to take him in flank while in the act of retreating. It is laid down that cavalry must not be exhausted on minor enterprises, but reserved for that which promises to have a direct influence on the decision of the battle.
4. To pursue the enemy, if he retreats.

Pursuit may be either tactical, that is direct pursuit, or strategical, that is directed against the enemy's line of communication or bases.

5. To delay the enemy if he is successful.
   This may be done either by directly covering the retreat of its own army and protecting their rear and flanks from the pursuing cavalry, or by threatening the enemy in another quarter with a view to drawing off some of the forces in pursuit or making it dangerous for them to press it.

Duties of Protective Cavalry.

The protective cavalry will, in the first instance at all events, be under the command of the General Officer Commanding the army or group of infantry divisions whose front it is covering.

The duties of the protective cavalry, when the opposing forces are at a distance, will be :—

1. To give the commander of the force it is covering timely information of the enemy's approach.
2. To obtain information with regard to the tactical features, resources, and communications of the country in advance of the main body.
3. To prevent the enemy obtaining information as to the columns in rear.
4. To oppose any hostile enterprise.
5. To seize important tactical points and hold them until occupied by the artillery or infantry.

Duties of Divisional Cavalry.

The Divisional Cavalry will be under the direct orders of the General Officer Commanding the division to which they are attached.

Their duties will be :—

1. To supply men for patrols in connection with the advanced flank, and rear guards, and also with the

outposts, and thus assist the infantry in the immediate protection of the division;

2. To maintain connection with the Protective Cavalry and neighbouring divisions; and
3. To furnish escorts, orderlies, and despatch riders for the general purposes of intercommunication.

II. The Advance.

A. INDEPENDENT CAVALRY.

(*a*) *Before the Forces are within Striking Distance.*

Dispositions on March.

Provided that the commander can retain sufficient control and quickly concentrate his force, should occasion require it, the main body of the Independent Cavalry may march in one or more columns, each column providing for its own protection, and marching in whatever formation is best calculated to save the horses.

When cavalry are advancing they will be protected by an advanced guard as well as by flanking patrols.

It is laid down that the general policy of a cavalry advanced guard must be to move quickly by successive movements from the front end of one defile—whether it be between hills, woods, villages, or any other natural features—to the front end of the next, thus securing for the force which they are covering one pivot of manœuvre after another. It is also stated that the advanced guard should be through the defile before the head of the main body reaches it.

To prevent the force being surprised a few patrols will be pushed out to the flanks as far as the limit of effective artillery fire.

For general principles as to these patrols, see pp. 20–22.

Care of Horses.

Necessity for Economy of Horses.

It must always be borne in mind that if the cavalry are to carry out with the greatest effect the work which will fall to them in the crises of a campaign when they are most needed, the horses must be kept in a condition which will enable them to bear the immense strain which will then be put on them. The wear and tear of horses for objects of a secondary nature must be kept within the strictest limits. It will be but the poorest economy to gain a number of secondary objects at the expense of thousands of horses if, at a great crisis, such as a pursuit after an important battle, or a series of rear-guard actions to protect a defeated force, those horses are unable to bear the strain which is put on them and fail when they are most required.

Length of March.

It is laid down that the daily march should be the lowest compatible with the attainment of the objective, and that an average of from 20 to 25 miles a day is in practice a very considerable performance, and more cannot be demanded for any length of time without considerable casualties resulting. Fifteen miles a day is, however, a very fair average.

As to saving horses on the march, see pp. 400–402; as to treatment of injuries arising from marching, see pp. 406–423.

Encampments.

Rest at night must be reckoned as among the most important measures for keeping horses in condition, and to effect this there is little doubt that in a cold or even in a temperate climate billets, if at all suitable, are greatly to be preferred to bivouacs. By going into billets the wear on horses which results from a wet night in the open is saved, and this more than compensates for an extra three to four miles of march which may be entailed.

When cavalry, who are in close proximity to the enemy, go into billets a thorough system of protective reconnaissances must be organised by means of observation posts and patrols, who remain in touch with the enemy.

General von Bernhardi, in his "Cavalry in Future Wars," holds that the cavalry which in full confidence of its firearms and the alertness of its patrols, can venture to go into cantonments and thus save its horses from bivouacking, will soon assert its superiority over an enemy which seeks safety by remaining constantly under arms, and thus dissipates its inherent energy.

(b) *After the Forces are within Striking Distance.*

General Disposition on March.

It is laid down that the general disposition of a brigade or division of cavalry when within striking distance will be an advanced guard and main body with two wings.

As to tactical reconnoitring patrols, see p. 74.

Position of Artillery during March.

It is laid down that on the line of march the horse artillery should be as near the head of the column as is consistent with safety. In the case of a cavalry brigade acting independently, they will move in rear of the leading regiment, and with a division in rear of the leading brigade. In open country, and when the forces are within striking distance of each other, the artillery will usually move massed on one flank of the cavalry, and will be generally accompanied by the machine guns as an escort.

Position of Transport during March.

The first line transport will follow the cavalry, but at a sufficient distance to avoid being involved in the action, while the second line transport, if it is to be concentrated, will park at some place suitable for defence.

B. PROTECTIVE CAVALRY.

(*a*) *Before the Forces are within Striking Distance.*

It is stated in "Cavalry Training," that the Protective Cavalry will be disposed as best to suit the nature of the country, but that as a rule the bulk will be as concentrated as the nature of the duties will permit, the remainder being employed as patrols (as already dealt with on p. 73) and supports to patrols.

In order to secure one natural feature after another, to save the horses unnecessary fatigue by prolonged marching at a slow rate, and to prevent a number of squadrons being broken up, the Protective Cavalry may sometimes establish a line of observation posts some distance in advance, with squadrons in support. The remainder will then concentrate and move up to this line at a more rapid rate than would otherwise be possible. When the line of these posts has been reached, the main body of the cavalry may halt and occupy that line until a fresh one has been taken up, or, as an alternative, they may themselves pass through the line and take up another—the troops who held the first line then moving forward to the new line. The country between the advanced outpost line and the main body of the cavalry should certainly be patrolled when the distance between them is material.

Protective Cavalry, when advancing, will be protected by an advanced guard as well as by flanking patrols, as in the case of the Independent Cavalry (see p. 132).

(*b*) *After the Forces are within Striking Distance.*

During the advance the Protective Cavalry may often be called on to occupy positions suitable for the main body, and particularly artillery positions, in order to deny them to the enemy, and at the same time with the help of Horse Artillery to delay his advance until these positions have been occupied by the advanced guards of the infantry columns.

It is stated that when the opposing forces approach close to one another, the Protective Cavalry will begin to concentrate with a view to suitable employment, which will depend on the plan of operations of the whole force.

General Dispositions on March.

If concentrated, the general disposition of, say, a brigade of cavalry when within striking distance may be an advanced guard and main body with two wings.

If the force is not concentrated, each portion of it must make arrangements for its own protection. Since Mounted Rifles are very vulnerable if surprised while mounted, they should always be protected by scouts or patrols which can give them sufficient warning to enable them to dismount and meet an attack.

Except when moving along roads, an officer or N.C.O. should ride some way ahead of the column, but within the line of scouts, so as to indicate the best line of advance.

Tactical Reconnoitring Patrols. See p. 73.

Position of Artillery during March. See p. 154.

Position of Transport during March. See p. 154.

Care of Horses. See p. 152.

C. DIVISIONAL CAVALRY.

(*a*) *Before the Forces are within Striking Distance.*

The general duties of the Divisional Cavalry have already been dealt with on p. 151. For further information as to their duties with advanced and flank guards respectively, see pp. 14 and 20.

(*b*) *After the Forces are within Striking Distance.*

For Advanced and Flank Guards, see pp. 10 and 19; and for protective patrols, see pp. 14 and 20.

Economy of Orderlies.

If small numbers of Divisional Cavalry are to be able to carry out their work during a campaign, economy must be exercised in the number of orderlies. They should be promptly returned to the unit from which they were despatched, and not be detailed for other duties than those for which they were intended.

If the country is suitable, the use of cyclists or motor vehicles will relieve the orderlies of the Divisional Cavalry of a great deal of their work.

Care of Horses.

See p. 152.

III. Mounted Attack.

GENERAL PRINCIPLES.

Duties of Commanders.

To detail the duties and the qualities required of any leader of cavalry acting independently would be beyond the scope of this book, including as they do not only a complete knowledge of his own arm, but also of the general principles on which all other arms operate.

For the present purpose it is perhaps sufficient to say that the commander must ever keep before him the demands which may be made on the cavalry after the battle, whether for the pursuit of the enemy or to cover the retreat of the infantry. He must also endeavour, so far as it is possible, to look at all operations in their true proportions, and so avoid the great fault of dissipating a great portion of his strength on objects of but secondary importance.

General Dispositions for Attack in a Cavalry Action.

It is laid down that the tactical formation must be of the simplest, and capable of any rapid alteration which may be required by a sudden change of situation.

The following includes a summary of the general principles laid down in "Cavalry Training."

(*a*) *Concentration of Force.*

Success can only be guaranteed by the concentration of sufficient force at the right time and place.

(b) "*Outer Lines.*"

So that the enemy's lines of retreat may cross one another, or if he is successful, so that his pursuit may be divided, "outer lines" should, if possible, be secured by previous operations.

(c) *Uniting easier than Deploying Outwards.*

It is easier to unite troops for action towards the front than to deploy them outwards from a common centre.

(d) *Protection of a Flank.*

If possible, one flank should be secured by inaccessible or difficult ground, so that only the other flank needs to be strengthened.

(e) *Flank Attack.*

If the enemy is in numerical superiority, every effort should be made to throw the whole weight of the charge unexpectedly against his flank and so compel him at the last moment to change his front.

An attack on the flank brings immediate pressure against the enemy's line of retreat and compels him to employ his own forces in succession and not in a concentrated effort.

If the enemy is numerically inferior or remains for some time in a faulty disposition, he should be attacked in front as well as in flank.

(f) *Shape and Direction of the Attack.*

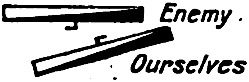
The shape of the attack, especially its breadth of front, will be determined by the nature of the ground which has to be crossed, as well as by the width of the enemy's front. If the front attack is too narrow, the attacking troops will not only have to face the enemy's fire in its immediate front, but they will be the focus of fire from all sides. General von Bernhardi states that the depth of the attack must be decided by the commander's estimate of the quality of his adversary's force, hence his shock power and the probable number of his reserves. If there is not sufficient depth, there will not of course be sufficient penetrating power. It must be borne in mind that the first line or two may be almost destroyed by the enemy's fire.

Rapid deployment to the front must be secured, the necessary depth being supplied by the supports.

Lines in echelon in rear must always operate so as to support the attacking line.

Though tactical victory must always be the first consideration, deployment should be made in such a direction as to force the enemy if possible to retire in the direction most disadvantageous to him.

The general principle to be observed in the case of one force of cavalry attacking another force of cavalry is to strike it at an angle and to avoid coming up square to it. The tendency is for the flanks to gallop up square. This is a mistake.



(g) *Reserve.*

The retention of a reserve to guard against the unexpected is of the greatest importance.

Only when the inner flank rests on an impassable obstacle should the reserve be on the same flank as the support. On other occasions the commander will be guided by the nature of the country, the direction of the wind in a dusty country being counted as an important factor.

Action of Horse Artillery in a Cavalry Action.

It is stated in "Field Artillery Training" that the first position which the artillery will take up will usually be well to the front and on the protected flank, and will be selected with a view to bringing the most effective fire to bear on the enemy's cavalry just prior to the charge. Since success depends upon the result of the cavalry charge, the paramount duty of the Horse Artillery is to shatter the enemy's cavalry, and only when the enemy's cavalry are masked will they turn their fire on the enemy's artillery.

Machine Guns.

Machine guns massed under one commander will usually co-operate with the Horse Artillery. They may often form the only escort of the artillery, thus enabling a squadron or more to be added to the fighting line.

As to tactical handling of machine guns, see p. 314.

THE ACTUAL ATTACK.

Attack with Arme Blanche by Large Bodies.

It is laid down that the encounter should not be broken up into a series of successive episodes, but should be the *simultaneous* action of all the brigades either in a parallel or converging direction, each unit, after being led forward in the formation best suited to the ground and the military situation, fighting on its own account but with an objective common to all.

The commander will so far as it is possible assign to each brigade or smaller unit some particluar task, and it will lie with the leaders to make the utmost use of the ground in carrying out that task and to use whatever formation seems best suited to that end. Situations in the case of cavalry change with such extraordinary rapidity that it is usually quite impossible for the commander to foresee the many different phases which may occur in the course of the attack, and leaders must therefore be prepared to exercise their initiative, always however keeping before them the main objective.

As regards the actual details of an attack, while no attempt can be made to specify the proper action of cavalry under the numerous circumstances which may arise in an attack on either cavalry, artillery or infantry, the main principles are dealt with shortly on p. 157.

It is laid down that to re-establish a doubtful engagement, a counter-attack must during the *mêlée* be made by the reserve on the inner flank or rear of the enemy.

Attack with Arme Blanche by Small Bodies.

General Principles.

No definite rules can be laid down as to when a charge should be made. The power of quickly grasping a situation will alone enable a commander to recognise the occasion for employing a charge. When the time does come, there may be only a few moments for decision, or the opportunity to charge, if it is an opportunity, will probably be gone. To take a few obvious instances beyond that of a great cavalry fight: if the enemy is shaken by fire, tired out by fighting, if he is advancing in a formation or over ground which would place him at a disadvantage, or if his guns are exposed to capture, then is the time when a charge may succeed. But a commander must always consider even in these circumstances whether a charge would be more likely to succeed than fire action alone.

At other times, say, either in a retreat or when the guns are in danger and fire action is unable to keep the enemy at bay, a body of cavalry may sacrifice themselves in one last attempt to delay the enemy and gain time.

Military history is full of instances of the cavalry gaining the day or saving the situation by splendid self-sacrifice, and these opportunities, though possibly under different conditions, will certainly repeat themselves.

(1) *Against Cavalry.*

If an attack on cavalry is to be made, an advantage lies with the commander of the attacking force rather than with his opponent. Not only has his opponent to accept the situation at the moment which the other has chosen, but he is forced to assume a formation hurriedly for either defence or counter-attack.

Tactical formations should be as simple as possible, so as to be capable of rapid alteration to suit any change of situation. An advantage obviously lies with the commander who deploys last.

It is almost needless to reiterate that in a charge, the greater the surprise, the greater the effect.

Formation.

Among the formations which may be adopted by a squadron or larger body are the following, the numbers detailed for each line, for the support or for a covering party, obviously varying with the total number of men available :—

(1) One troop in two ranks to charge the enemy on either flank, with the two other troops in two ranks following behind them, at say 200 yards distance.

(2) The same formation, with the exception that the two other troops in two ranks, charge the enemy in front.

(3) One line of, say, two troops in two ranks, with the remaining troops following, one on each flank or one on one flank and one in the centre ; both troops being at about 200 yards from the leading troops, or one at that distance and one about 400 yards.

(4) The same formation, but with the supporting troops following on the flank on which it is intended to strike the main blow, or the flank from which a counter-attack is most likely to be made, the first troop in support following at, say, 200 yards distance, and the second at, say, 400 yards.

(5) The same formation, but with the supporting troops echeloned as second and third lines, instead of immediately following one another.

(6) One line of, say, one or two troops, in two ranks, with a detachment following close on either flank, and the sup-

port on one flank, at a greater distance, a dismounted covering party remaining on the other flank.

No definite rules can be laid down as to which of these, or what other formation, should be adopted on different occasions. The commander must judge which is likely to be the most effective for the purpose of piercing the enemy and at the same time protecting his own flanks from hostile counter-attack.

The object being not only to pierce the enemy but to rout him, the attacking squadron—if the enemy is in close formation—must be in close formation also, but if he is in extended formation, they likewise must be in an extended formation.

Duties of the Different Lines in a Charge.

In a charge the main duty of the first line is to pierce the enemy's front, without taking any particular precautions for the protection of its own flanks. The main duties of the second line, or second and third lines, as the case may be, is to assist the first line by making it longer and thus attempt to envelop the enemy's flanks. These lines, while repelling any attacks on the flanks of the first line, must attack the enemy's second or other lines, if he has more than one line. A reserve must be kept in hand, since the commander who has the last reserve to throw into the *mêlée*, has the best chance of carrying the day.

Distance at which to begin Galloping.

The distance at which the gallop should be taken up must depend on a variety of circumstances, such as the ground and the exact moment at which it is desired to reach the enemy, but the horses must on no account be brought in a blown condition to the point where the actual charge takes place.

Pace.

Whilst under fire the cavalry should advance at a fast pace, and, if necessary, extended, and then steady the pace or halt in any available cover.

When not under fire, cohesion is more important than pace, and accordingly, unless there is a possibility of surprise, it is better to trot to within 50 yards of the enemy.

The Charge.

At about 50 yards from the enemy, the front rank should bring their lances or swords to the engage with a cheer, and, sitting down in their saddles and leaning slightly forward ready for the impact, ride at the greatest speed at which the horses can gallop and yet maintain their proper formation.

The rear-rank men, if armed with lances, should keep far enough back to enable them to use their lances after the front rank have struck the enemy; while, if armed with the sword, they should drop back a horse's length, bringing their swords to the engage just before reaching him. Rear-rank men should immediately replace any front-rank men who may fall during the charge, and also fill up any gaps which may occur.

Each man as he actually approaches the enemy should make for one opponent. In the *mêlée*, which must necessarily follow if the enemy does not break, the men must gradually work forward so as to get through the enemy, then re-form, and, if necessary, charge again.

Rallying to Charge Again.

If another charge becomes necessary, the men should rally as quickly as possible in any units in which they find themselves, and, after withdrawing to such a distance as will give them impetus, or space to manœuvre, charge again.

If the enemy breaks, either before the moment of impact or as the result of the *mêlée* or second charge, the pursuit must be at once taken up.

Squadrons will either pursue at once without re-forming, in which case a reserve must invariably be kept in hand to meet any hostile cavalry, or they will re-form immediately and then pursue.

The main principles are to keep the enemy engaged, to prevent him from rallying and to cause him as much loss as possible before the pursuit has to be abandoned, owing, for instance, to the proximity of his reinforcements. Officers and men must remember the absolute necessity of not continuing the pursuit too far, unless in sufficient strength.

Should the charge be unsuccessful, the men should be rallied and withdrawn to some point from which they may essay another charge, or even retire. Here, again, the advantage of co-operating with a dismounted party is apparent, since immediately the mounted men are clear of the enemy, the dismounted party can open fire.

(2) *Against Artillery.*

Time for Attack.

If an attack is to be made on artillery, it should be launched, if possible, when the artillery are in movement, or are just coming into, or out of, action, because at such a time they are, but for their escort, entirely defenceless. If a surprise can be effected, cavalry should attack in whatever formation it finds itself.

Flank Attack whenever Possible.

If the guns are in action, an attack should, where possible, be made on one or both flanks, or on the rear, and only as a last resort should the main attack be frontal.

A frontal attack would probably only be attempted where the guns could be absolutely surprised, but if such an attack is inevitable it is best carried out by, say, three or four successive lines in extended order.

The particular advantage in making an attack in flank is that the gunners have a difficulty, when in line, of firing direct to their flank, or quickly coming into action on that flank.

To attract the attention of the enemy's gunners, small detachments in extended order may be sent to attack the whole front of guns simultaneously with the main attack. Of the others, a strong detachment should be detailed to attack the escort, the formation of the detachment being governed by the same considerations as would govern an attack on cavalry or infantry. The remainder should be so disposed as to take the guns on one or both flanks, or in the rear, and in such formation as is best suited to the ground. An attempt should be made, where possible, to capture the gun or limber teams, and a party should be detailed for this purpose.

In order to be under fire for as short a time as possible, it may be necessary to gallop for a considerable distance, but if it is necessary, advantage should be taken of all depressions in the ground to slacken the pace and ease the horses.

If a charge is extended order has been made, the men should re-form in close order directly after it. They should not attempt to join their own units, but rally on the nearest leader.

(3) *Against Infantry.*

Time for Attack.

The best chances of an attack being successful usually show themselves at the end of a long day's fight, or when the infantry are surprised, taken in flank, or demoralised by a heavy fire. Infantry are usually very susceptible to an attack in flank in the later stages of an action, since their formation is then probably shallower than it was at the beginning, owing to a great part of the reserves having been placed in the firing line.

Formation of Cavalry.

If cavalry is to make an attack on infantry, its formation must, of course, depend on the formation of the infantry. If the enemy is in extended order, the cavalry must adopt that order, while if he is in close order, the cavalry should be in close order also. But unless they are seen to be at a great disadvantage, or unless they can be taken completely by surprise, unbroken infantry should not be charged by cavalry.

In order that the attacking force may not become the focus of fire both from the troops whom it is directly attacking and from those on either flank, as many attacking units should be formed as there are bodies of the enemy in the immediate vicinity.

Where no cover is available during the advance, it is usually expedient to begin galloping at a considerable distance from the position to be attacked, in order to minimise losses.

The impetus of a charge is perhaps more likely to carry cavalry through infantry than it is through other cavalry, and it may therefore be necessary to charge infantry a second or even a third time. The plan of sending a second line shortly after the first has obvious advantages, especially if it reaches the infantry at the moment when they have been shaken, if not actually broken, by the charge of the first line. For this reason a second line, or if necessary a third or even a fourth, should, whenever possible, be formed for the purpose.

When the enemy is in close order, a very similar formation to that detailed for cavalry may be adopted, but, if sufficient men are available, one or more lines in extended order should mask the real attack. A simultaneous attack should be delivered, if possible, from more than one direction.

IV. Dismounted Attack.

GENERAL PRINCIPLES.

Occasions when Dismounted Action used in Attack.

While Cavalry very often act dismounted, Mounted Rifles, including in that term all Yeomanry, Mounted Infantry, Light Horse, and other Colonial Horse, invariably do so.

Dismounted action is called for not only to clear the ground for an attack by the main body of infantry, or to induce the enemy to disclose his strength and position, but to seize points either before or during the battle, and when the pursuit has begun, to harass and, if possible, intercept his retreat.

Principles Governing the Action of Mounted Rifles.

To make full use of their mobility, and at the same time to develop quickly the greatest fire effect, must be the aim of all Mounted Rifles.

To this end they will seldom build up their firing line gradually like the infantry, but will develop almost from the first their full fire power, while they will, particularly if acting alone, engage the enemy in front, and at the same time do their utmost to turn his flank, or, better still, to threaten his rear. They will endeavour to seize one tactical point after another, and if at any point they become too seriously engaged, they will probably break off the fight to renew it under more favourable circumstances at another.

Co-operation of Mounted Rifles with Cavalry against Cavalry.

If cavalry is to deliver an attack mounted, Mounted Rifles should endeavour to seize points of tactical importance, from which they can open an effective fire on the opposing cavalry, and if the attack succeeds, confirm the success, or, if the attack fails, form a rallying point for the cavalry.

These points should be occupied, if possible, without the knowledge of the enemy, and unless some exceptional target appears, fire should be withheld until the hostile cavalry is within effective range. Rapid fire should then be opened and maintained until the moment of contact.

Co-operation of Mounted Rifles with other Arms in Battle.

When two infantry forces come into close contact, the cavalry and also the mounted troops who have hitherto been employed on protective duties can no longer remain in the front of their infantry, but must withdraw, probably to a flank. The Cavalry, supported possibly by some of the Mounted Rifles, will then seek every opportunity for decisive action. Other bodies of Mounted Rifles will assist both in turning movements and in seizing and holding positions until occupied by the more slowly moving infantry, while others may be allotted to the general reserve to watch its flanks during the decisive attack, and those who are employed as division cavalry the flanks of their respective divisions. If the attack is successful, the Cavalry and Mounted Rifles must harass the retreating enemy, and spare neither men nor horses in the effort to rout him utterly, while, if retreat becomes necessary, the Mounted Rifles must bear the brunt of holding the enemy at bay while the infantry retire and reorganise.

THE ACTUAL ATTACK.

Flank Attack and Enfilading Fire.

In making any attack on an enemy in position an attempt should always be made to envelop one of his flanks. The well-directed enfilade fire of even a very few men has often been shown to be of the very greatest assistance to the main frontal attack. Officers should therefore always watch for opportunities to seize points from which they can enfilade the enemy's position. The enemy should as far as possible be engaged at all points, particularly if he is mounted, so that he may not be able to thin his line at any point to meet the attack threatened from the flank.

Communication between Different Parts of Force.

To ensure co-operation it is necessary before the attack to organise means of communication between all parts of the force, so that not only the commander but the leaders of neighbouring bodies may be kept fully informed of the others' movements.

The Advance prior to Dismounting for Action.

The great precept that surprise adds enormously to the force of an attack should guide all movements when approaching the enemy. For this reason any favourable cover, whether it be hills, woods, or dips in the ground, must be utilised with that end in view, except, of course, on occasions when every moment is of importance, and when the search for cover might lead the force off the direct line.

If the cover is sufficient to hide the advancing force from the enemy's guns, the troops may be moved in close order, for in such order they are more readily handled. If, however, there is not enough cover, they should be extended to at least two horses' length. The extent of the front, whether it be that of a squadron, troop, or section, may depend wholly on circumstances, such as, for instance, whether or not there are supports, the extent of front which has to be attacked, and the ground that has to be passed over.

When extended the centre group will, unless otherwise ordered, form the unit of direction.

Distance at which to Dismount for Action.

As so much depends on the nature of the ground, and also on the circumstances of the attack, it is difficult to lay down any exact rules as to the distance from the enemy at which men should dismount. Long advances on foot should, however, be avoided, and the horses brought as far as they can be with reasonable safety.

It may, however, be taken as a general rule that, on open ground, and when there is no cover, anything under 800 yards would expose the men and horses to great fire risks, at any rate at the moment of dismounting and handing over horses. In all cases each section should rally on its leader, dismount as quickly as possible, and extend at once. An officer or non-commissioned officer, when moving horses to some place under cover, should be careful that the horse holders do not keep too close together if within sight of the enemy's gunners.

Galloping to Close Quarters before dismounting.

Mounted bodies may sometimes be able to gallop in extended order over a fire-swept piece of ground, and yet do it so quickly as not to give the defenders time to pour in any great amount of fire. In this way they may be able to reach some fire position at comparatively close quarters to that held by the enemy, but it is obvious that before deciding to do this a commander must satisfy himself that there will be sufficient cover for his led horses.

In order to maintain direction and the proper extension, the commander should before ordering the advance give three prominent objects on the fire position, one as an objective for the right of the line, one for the centre, and one for the left. The men should then be ordered immediately they advance to extend between these points.

When each group comes near to the point which it is to occupy when dismounted, the men should close on their centre and dismount, the horses being left under the best cover available. The squadron or company commanders should then indicate further objectives to their troop or section leaders, and the men should move on to the fire position, being careful, if it is a skyline, not to expose themselves to view.

Covering Fire.

When advancing to the attack, within, at all events, effective range, the advance of one body should be covered by the fire of the others. Commanders of units which are halted for the time being should always be on the look-out to assist with their fire the advance of other units.

When an attack is made against a small body, and is carried out dismounted, a covering party should, as a rule, form part of the attack, that is to say, a party posted in a good place from which to keep up a fire on the enemy's position, while the attacking line makes its way under cover, probably with very little firing, to within close range or to actual assault. This covering party also covers the retirement, should the attack be unsuccessful. It may occasionally be so posted as also by its fire to protect the led horses against attack.

Escort to Led Horses.

The led horses will usually be protected by the dismounted men, but if the men have to move away from their horses so that the horses would be exposed to attack, the commander should detail an escort. So that they may at once take up their duties when ordered, certain sections or a troop, for instance the left flank sections or troop or the rear sections or troop, should always be detailed beforehand for the purpose. The strength of this escort must depend both on the nature of the ground, and whether or not the enemy has mounted troops at hand who might suddenly attack the led horses.

The main purpose of such an escort is to guard the led horses against capture or stampede, and for this purpose a suitable position, with good cover if possible, should be chosen on the most exposed flank. A non-commissioned officer of this escort should personally endeavour to watch both the dismounted men and the enemy.

The escort will also be ready to follow up a success, or to cover the retreat of the dismounted men in the event of their having to retire under very disadvantageous circumstances. Should a favourable opportunity occur for actively assisting the dismounted men, it may be taken, provided that it can be done without any risk to the led horses. But the non-commissioned officer in command of the escort must always bear in mind that the security of his own led horses is his first duty.

In view of the fact that if the escort and led horses were kept directly to the rear of the dismounted men, they would probably receive some of the bullets intended for that party, they should not be kept in that position unless well under cover from fire.

Mounted Scouts to Dismounted Parties.

Whenever mounted troops act dismounted, mounted scouts should be sent out on the flanks to watch the enemy and preclude the possibility of the party being surprised. The scouts must place themselves in suitable positions for this purpose under such cover as is available, but should not omit to watch every avenue of approach to the dismounted men. In the event of the led horses being so situated that the non-commissioned officer in command of them cannot easily keep in touch with the dismounted men, it is advisable to detail a mounted orderly to accompany them. But if the ground is too open, it is better to throw forward a man who can watch both parties and act as a connecting file. A man from the escort, if one has been detailed, can be used for this purpose, and he should be instructed to pass any signals on to the escort.

Position of Supports to Attacking Force.

The supports to the firing line must be so placed as best to render assistance to any part of the line to which they are detailed, and must be sufficiently close to be able to reinforce the line quickly in the event of its being checked. The exact distance must depend to a considerable degree on the extent of front to which they have to act as supports, the nature and quantity of the cover of which they can avail themselves, and whether or not there is a reserve. If there is a reserve, the supports will usually be about 200 to 300 yards behind the firing line. If there is no reserve, a portion, at least, of the supports must be held back, because it is all important that the commander should retain a force, however small, with which to deliver a decisive stroke at any moment and at any point required.

It is also the duty of the supports to protect the flanks of the firing line against any hostile attack, unless some force is particularly detailed for the work.

The formation adopted by the supports must depend on the nature of the ground. If sufficient cover is available, they may be only slightly extended, but if the cover is bad or insufficient, they may be extended in line, as in the case of the firing line. The greatest number of men should be kept on the exposed flank, so as to be prepared to meet any attack on that flank and ready to deliver a counter-stroke.

Fire.

For general principles of Fire Tactics, see pp. 294–319.

Advance by Rushes.

When dismounted, the best method of advancing to the attack, if the fire is hot, is by successive rushes, a troop or a half-troop, or even section at a time, according to the severity of the enemy's fire. As one half of the body rushes forward, the other half keeps up a hot fire until the first half have dropped under such cover as there is and have actually begun to fire. Then the second half may rush forward. A fully armed man can run on the average 25 yards in 5 seconds, which is the time usually required for an aimed shot.

The two halves should not be kept too close together, in case the men who are rushing forward mask the fire of those lying down. If the enemy's fire is too hot to allow of half a troop or even sections rushing at the same moment, men must run out singly for a short distance straight to their front and drop at once, immediately opening fire, in which process they will be covered by the fire of their comrades.

Duties of Flank Men of Firing Line.

An important point to see to is that the flank man of the firing line of any unit in action does not shoot, but confines himself to acting as the look-out man, firstly, to watch for the enemy trying to roll up the flanks ; secondly, to see what the other units of his side are doing ; and, thirdly, to keep on the look-out for signals from the supports or elsewhere as well as for any important moves.

Assault.

Mounted Rifles must be ready on occasions to carry a position by assault. If this becomes necessary, the firing line must press forward to a fire position close to the enemy, and from that position the heaviest fire possible should be concentrated on the point which it is decided to assault, though the enemy's fire must be neutralised all along the line.

Directly it becomes evident, either by the slackening of the enemy's fire or the beginning of a movement to the rear, that superiority of fire has been gained, the firing line should advance to the assault.

Obstacles may have to be overcome, and steps must be taken for effecting this.

The men should be on their guard against any false orders to retire which may be shouted from the enemy's position or from irresponsible quarters.

Magazines should be fully charged and bayonets fixed just before making the final rush. The supports should be pushed forward into the firing line, and all must then spring forward to the assault, every man cheering.

In the final rush, both the Japanese and Russians often fired as they dashed in, the object being not only to disturb the defenders' aim, but if possible to make them quit their position. Of the various ways of shooting while dashing in, that of firing from the hip, with the rifle aligned on the enemy's firing line, is probably the best.

After the Position is Carried.

If the position is carried, the most rapid fire should be poured on the retreating enemy, so as to prevent him rallying for a counter-attack.

Entrenching Position.

When once a position has been gained, it is essential to improve it, in case it may have to be held for a considerable time against a larger force—Spion Kop may be quoted as an example of the results of not taking this precaution. Though it will usually not be found practicable for men to dig standing up in the daylight, still, as shown by the Japanese in Manchuria, shallow trenches may be dug by men lying down if they have the necessary tools. The position may often be improved in other ways; for instance, where there are stones, they may be rolled together to form a screen behind which to lie, while if the country is enclosed with hedges and ditches, the hedges can be made to form a screen to hide at all events the position of each man, and the ditches can be utilised to give cover from bullets. If there are no ditches, the men must scrape up sufficient earth to afford cover while lying down. If empty sandbags are carried by the men, cover can, while lying down, very quickly be made by scraping the bags full of sand and building up them with any material which is at hand.

Should it be necessary to hold the position until the following day, regular entrenchments may, of course, be constructed under cover of darkness..

(As to form of fire trenches, see pp. 717-724 and Plates 82 and 83.)

Advance by Attacking Party.

If the enemy retreats, the horse-holders should bring up the horses and follow the firing line as closely as is safe ; while the dismounted men should be ready to mount and pursue, or move to a flank or elsewhere, directly they see an opportunity.

Action of Horse Artillery in a Dismounted Attack.

Cavalry cannot, any more than infantry, expect to turn a defender out of a well-covered position without the assistance of artillery.

It is laid down that the action of Horse Artillery, both as regards selection of positions, methods of coming into action, choice of objectives, etc., should be characterised by promptness and a readiness to take the initiative.

Their especial *rôle* is to support cavalry in the attack, to assist them to hold positions they may have gained, to cover their retirement, and to beat off counter-attacks.

The wide extent of front over which mounted troops may be called on to operate in dismounted action often requires a dispersion of batteries, and accordingly a section of guns may be attached to units of cavalry who are detailed for some isolated action.

If an escort is required, it will be usually furnished by Mounted Rifles.

Attack on a Battery.

In the event of the dismounted attack being directed against a battery, every endeavour should be made to effect a surprise.

If a surprise is no longer possible, a portion of the force should engage the attention of the escort, while the remainder try to work forward closer to the guns, so as to bring them under oblique fire at effective range. When opening fire against a battery, it should first be directed against any teams that are visible, so as to prevent, if possible, the guns being moved. The fire should then be turned on the gunners.

Attack on a Defile.

It is only when attacking a defile or some other place that cannot be outflanked, that mounted rifles will adopt the ordinary infantry method of attack. Accordingly, when a position such as this has to be carried, it will be necessary at the beginning of the attack to form the troops in several successive lines, from 200 to 300 yards in rear of one another, and then as they advance to build up the firing line by gradual reinforcement from the lines in rear, until just before the moment for assault it reaches, if need be, the maximum density of one rifle per yard. A reserve should, of course, be kept in hand to meet any counter-attack or to cover a retreat.

Rest for Men and Horses.

If cavalry are to be ready to take full advantage of any opportunity which may arise, time must be given to men and horses to feed, water, and rest, even during the progress of a battle.

VI. The Pursuit.

Strategical Pursuit.

Strategical pursuit, which will usually be undertaken by the cavalry, is that which is not directly aimed against a flying enemy, but is directed against either his line of retreat at a point more or less distant, against his line of communications, or against one or more of his bases.

Tactical Pursuit.

Tactical pursuit, on the other hand, which will usually be undertaken by the mounted rifles and infantry, is directed at a flying enemy with a view to directly harassing him, causing him as much loss as possible, and maintaining, and if possible increasing, the loss of *morale* which may have such important consequences.

Urgency of Pursuit.

When the enemy yields, and begins to retire, pursuit must be at once undertaken. Arrangements will probably be made beforehand for all mounted troops to act under the orders of the cavalry commander, but an officer, in the absence of explicit orders to the contrary, must at once take up the duty of pursuing the defeated enemy. No excuse can be accepted for not taking the fullest advantage of such an opportunity. Even when no longer able to pursue he must at least attempt to keep touch with the enemy. Military history furnishes few examples in which a decisive victory has been gained unless a defeat is followed by a successful pursuit.

Main Aims of the Mounted Troops in Pursuit.

The enemy, unless thoroughly disorganised, will probably attempt to take up some position in rear, and there re-form, preparatory to making another stand, his mounted troops meanwhile covering his retreat and retiring from one rearguard position to another. It will be the duty usually of the cavalry to try to anticipate the enemy at some bridge or defile on his line of communications, while the other mounted troops not only press him from the rear, but seize positions on his flanks and as far as possible harass his retreat. The infantry meanwhile will re-form after the attack, replenish ammunition, and continue the direct pursuit.

Dismounted Action.

Since it is only in a dismounted action that it is possible to break off an engagement with comparatively small loss and begin it again at another point, the rifle will probably play the principal part in a pursuit, and where the enemy is intercepted in a defile, usually the only part.

When following up the enemy, it will usually be found best to advance by a squadron or a company at a time, or by a smaller body if required, covered by the fire of the adjoining squadrons or companies. When the squadron which has advanced has taken up a suitable position, the next squadron or company can come up into line, and so on.

An enemy's flanks are often, during a retreat such as this, very vulnerable, and nothing will compel him to evacuate his position quicker than to enfilade his front. Consequently every attempt must be made to effect this.

Action of Horse Artillery.

If the mounted troops follow in pursuit, the Horse Artillery will do likewise, and will throughout endeavour to prevent the enemy re-forming and holding rear-guard positions.

Precautions during Pursuit.

Seeing that the enemy is almost certain to make attempts at rallying, and since a scattered attack on such rallies is very ineffectual, the men should be kept well in hand when in pursuit. This precaution is not intended to negative boldness, but to make it more effective.

At all times, particularly in the case of a small force, which has probably been detached from a larger one, care should be taken to see that the pursuers are not in their turn surprised by the enemy's main body, on which the retreating force may be falling back.

Independent Pursuit of a Small Force.

On occasions, particularly when mounted troops are independently pursuing a small force of not greater strength than their own, and at a time when a flanking party is endeavouring to get between the force and their main body, a few men may with advantage be left at the spot where the flanking party struck off. In this way the few men may by their fire lead the enemy to imagine that the entire body is still at the same place. But at times when the whole movements of the flanking party are visible, there is, of course, no point in this movement, more especially as it has the disadvantage of splitting up the party.

VII. Retreat.

A.—AFTER A CAVALRY ACTION.

Rallying Position.

If the attack fails and a retreat becomes necessary, the Horse Artillery will remain in action, if their position forms a suitable point on which the cavalry can re-form. In retiring, great care must be taken not to mask in any way the fire of the guns, but to rally in rear of one or both of their flanks. If the position of the guns does not form a suitable rallying point, the cavalry will rally at a point which offers some natural protection, the guns in the meantime taking up a position from which they can most readily check the enemy's advance.

When the cavalry have rallied and a retreat begins, the commander will decide whether he can best delay the enemy by occupying positions either blocking or flanking his line of advance, and also whether to employ the ordinary fire tactics of a rear guard or a resolute attack by cavalry. In considering the advisability of an attack by cavalry, the difficulty of rallying troops after the attack in the face of a pursuing enemy must not be under-estimated.

Rear Guard Fighting.

The general principles of rear guard fighting are given on p. 32.

Counter-attack.

If outer lines have been secured so that the enemy is divided in his pursuit, a tactical success may still be possible if a concentration can be effected against one of his forces.

B.—AFTER GENERAL ACTION.

If a retreat becomes inevitable, mounted troops must at all costs delay the enemy's advance, in order that the infantry may retire unmolested, take up another position, and there re-organise. Steps must also be taken to prevent the enemy seizing positions commanding the infantry's line of retreat.

Retirement from Hill to Led Horses.

If retiring from a hill to the horses below, squadrons or troops should as a rule fall back one at a time, one squadron or troop remaining to cover the final retirement of the remainder by keeping up a continual fire until they are mounted. In smaller bodies the men should fall back, one section at a time, a non-commissioned officer remaining with one section to cover the retirement of the remainder. To avoid frightening their horses, men should always walk for the last few yards before reaching them.

Retirement on Level Ground to the Led Horses.

The best method of retiring for each small body to adopt, when on the level, is by successive rushes, a troop or a half-troop, or a section, or even single men, as the case may be, at a time. As the first half of the body retire 50 yards or so, the second half keep up a hot fire until the others have dropped under such cover as there is, and have begun firing. The second half then retire under cover of the first half; and so on.

The retiring half-troops or sections, as the case may be, should not be kept too close together, or else those who are retiring may mask the fire of those lying down. Should the men retire one at a time, each man must retire to his direct rear, or he will mask the fire of the men on either side of him.

INFANTRY.

I. General Principles.

A.—COMMAND.

Position of Commanders.

Generally speaking, a commander should take up his position with a view—

1. To obtaining an extensive view;
2. To being central so as to facilitate:
    (*a*) The issue of orders;
    (*b*) The receipt of messages.

Subordinate commanders will take up the most suitable position from which—

1. To supervise their commands;
2. To keep the enemy in view;
3. To receive orders;
4. To transmit orders to their subordinates.

When there are two or more officers with a company, one at least should be with the firing line.

Duties of Battalion and Higher Commanders.

The duties of a commander are—

1. To make as careful a personal reconnaissance as possible;
2. To issue clear and concise orders, allotting objectives and providing for the combined action of his own force;

3. To retain in hand a reserve with which—
    - (*a*) To feed the firing line as and when required;
    - (*b*) To guard against flank attacks;
    - (*c*) To repel any counter-attack;
    - (*d*) To drive home any success which may be gained; and
    - (*e*) To cover retreat, if attack fails.
4. To maintain touch with any units which may be on either side of his force, and to maintain connection from front to rear;
5. If in command of only a portion of a larger force, to report to his superior commander.

When once troops have been launched to the attack, it will be very difficult for a commander to exercise any influence over the course of the action, except by means of the reserve which he has retained in hand.

Decentralisation of Command.

It has long been recognised that superior commanders should on nearly all occasions leave to their subordinate commanders the duty of carrying out orders, and should not attempt to exercise supervision over details which are the particular province of the subordinate. Apart from the effect on the subordinate, there is the far greater loss which must be sustained owing to the withdrawal—however temporary—of one whose responsibility for matters of greater moment cannot be transferred.

Thus a divisional commander will give his orders to brigadiers, brigadiers to regimental commanders, regimental to company commanders.

Perhaps the only exception to this rule is in some crisis when the commander feels that his own presence and his alone can rally the men.

At the same time subordinates must take care not to take too much initiative, and so involve their leaders in bigger fights than they may desire.

Duties of Company Commanders.

When companies are acting as portions of larger bodies, each company commander must explain to his subordinates both the orders he has received, and the method by which he proposes to execute them.

According to "Infantry Training" his duties are—

1. To detach scouts to the front, and if necessary to the flanks, to cover his advance;
2. To maintain the direction;
3. To direct the fire of his company (see Fire Direction, p. 297);
4. To co-operate with the companies on his flanks, to cover their advance by fire, and assist them if opportunity occurs, by enfilading, or firing obliquely on, a portion of the enemy's line;
5. To distribute the ammunition of casualties, and generally to maintain the supply of ammunition;
6. To acquaint the battalion commander of any change in the enemy's dispositions, or of useful information received from scouts;
7. To lead his company in the assault, and if it succeeds, rally and re-form the company, replenish ammunition, and by entrenching secure the position if necessary from counter-assault.

Duties of Platoon Commanders.

The duties of platoon commanders are—

1. To maintain the direction;
2. To be on the look-out for signals from the company commander and from the scouts;
3. To watch the enemy and report immediately to the commander anything of importance;
4. To control the fire of their platoons (see Fire Direction, p. 297), and to prevent any waste of ammunition;

5. During the advance to take all leaderless men of other companies and corps under their command until the action is over or the force re-forms;
6. If the assault succeeds to rally and re-form their platoons.

Duties of Section Leaders.

The duties of section leaders are:—

1. To control the fire of their sections (see Fire Direction, p. 297).
2. To be on the look-out for signals from platoon commanders and to pass all orders received;
3. To lead their sections in the advance, and if it is successful, to assist in rallying and re-forming the men;
4. If the officers fall, to continue the advance without waiting for orders or signals.

Duties of Squad Leaders.

The duties of squad leaders are:—

1. To control the fire of their own squads, when the section leaders are no longer able to control the fire of the sections;
2. To be on the look-out for signals, and to pass all orders and signals;
3. To lead their squads in the attack, and if successful, to assist in rallying and re-forming the men;
4. If the section leaders fall, to continue the advance without waiting for signals or orders.

B.—General Method of Attack.

An enemy can seldom be overwhelmed at every point. One point must be chosen, and there he must be attacked with overwhelming force, while at every other point he must be held to his ground by a steady and, if possible, increasing pressure. He must be prevented from either thinning his line at one point, to reinforce it at that which is more threatened, or actually changing his front.

Points at which Attacks should be launched.

An attack on the flank of the whole position, or in an extended battle front an attack enveloping one wing of the point chosen for the decisive attack, offers the following, amongst other, advantages: firstly, the defender cannot so readily concentrate on the attack the same amount of fire as he could on a frontal attack; secondly, a searching and enfilading fire is more telling than a frontal fire; and, lastly, his line of retreat is usually more easily threatened.

Major Mitake, Japanese Army, said (*Journal R.U.S.I.*): "All the testimony from the recent war goes to show both in large engagements and in small, that there was but one method of attack, namely, the selection and envelopment of one wing of the decisive point, but whether it be the selection of one wing of the decisive point, envelopment or superiority of fire, all depends on the ability to bring superior strength to bear on the point under attack." A calculation as to what will be superior strength at that point is therefore of the highest importance.

Attack on Advanced Positions.

If the enemy's advanced positions are strongly held, each of them may in its turn have to be attacked as if it were the main one, and a decisive attack developed. Advanced positions, however, are sometimes more readily outflanked, and thus more easily carried than the main position.

Ruses.

A successful ruse which deceives the enemy as to the strength of an attack, or leads him to expend his reserves or, possibly misleads him as to the direction of the decisive attack, may have the most far-reaching consequences. Whenever, therefore, an opportunity arises, it should be eagerly sought.

Many ruses can of course be effected by apparent retirements, by clever handling of fire, or by such tactics as openly constructing a bridge which it is never intended to use. But each situation will suggest its own possibilities.

Importance of Hiding Decisive Attack.

It is obvious that it is of supreme importance to hide from the enemy as long as possible the direction and nature of what is to be the decisive attack, accordingly the force which is to carry out the attack should as far as possible be kept from view until the attack is launched. It must be remembered that in a dry country the clouds of dust caused by large bodies of troops have on more than one occasion betrayed the advance of a large force, which was still unseen, and would otherwise have been quite undetected. The Japanese, in order to hide the passage of troops across an open stretch, often planted a screen of branches or small trees, or hung branches on ropes stretched between other trees. On one occasion they even planted a thick avenue of trees down the side of a hill.

When the attack is launched, it must be pressed home with weight of numbers and great determination.

II. Division of Force and Duties of the Different Parts.

A.—DIVISION OF THE FORCE.

Distribution.

Infantry, whether of the strength of a company, battalion, brigade or larger force, is formed into three bodies, distributed in depth :—

The first, which develops the attack, is divided into :

(*a*) Scouts ;
(*b*) Firing line } These will usually be formed from the
(*c*) Supports } same companies.

The second, namely, the reserves in the hands of the battalion, brigade, and other commanders, which reinforces and if possible completes the attack.

The third, namely, the general reserve, which remains in the hands of the commander of the whole force if necessary to make the decisive attack, or meet any unforeseen emergency.

Usual Strength of Attack at Decisive Point and elsewhere.

The general principle is that the enemy must be engaged all along his line in sufficient strength to hold him to his ground, and at the decisive point must be struck with the greatest strength possible.

The force required to hold him to his ground will vary according to the fighting qualities of the opponent. Where they are approximately the same as our own, but our artillery is slightly superior, a force equal to that of the enemy actually holding the position, apart from his general reserves, is the least which will suffice. To estimate this very roughly, the strength of the enemy's firing line may be taken as at most one man per yard of front, his supports $\frac{1}{5}$ to $\frac{1}{2}$ of that number, and his local reserves as equivalent to the two taken together. The total may therefore be taken as two to three men per yard of front.

The distribution of this attacking force along the front will vary according to the circumstances and the nature of the ground, the frontage varying from one man to three or more men per yard. The firing line and supports may absorb perhaps $\frac{5}{8}$ to $\frac{3}{4}$ of the force, and the reserves $\frac{3}{8}$ to $\frac{1}{4}$.

For the decisive attack, a force of less strength than 3 to 5 men per yard of the front on which the decisive attack is to be delivered will rarely prove sufficient. This force will be distributed in depth according to circumstances.

B.—DUTIES OF DIFFERENT PARTS OF A FORCE.

Duties of Scouts.

The general duties of infantry scouts are :—

(1) To reconnoitre the ground to the front and flanks, and for this purpose to be sufficiently far out to protect the body from surprise.

(2) To ascertain and report :—

(*a*) The extent and nature of the enemy's position ;
(*b*) The position of his guns ;
(*c*) The extent and position of his entrenchments ;
(*d*) His dispositions and strength ;
(*e*) The position of supports and reserve.

(For further information as to points on which to report, see p. 118.)

Information may sometimes be obtained by drawing the enemy's fire at one point and reconnoitring at another.

The special duties of ground scouts are :—

To reconnoitre the ground in front of the advance, and to point out :—

(*a*) Any obstacles to the advance ;
(*b*) The best line of advance ;
(*c*) The most suitable cover.

The special fighting duties, as distinguished from reconnoitring duties, which, according to "Infantry Training," scouts or infantry skirmishers may be called on to perform are :—

1. To keep down the fire of the enemy's scouts and snipers, to ambush them, and to drive them off ;
2. To seize quickly points of importance ;
3. To cover retirement from difficult positions ;
4. To act on ground which is too difficult for ordinary infantry.

Communicating Files.

In country which is close or undulating, it will invariably be necessary to detail communicating files, to maintain touch between the scouts and the body which is advancing.

Duties of Scout Officers.

To make themselves thoroughly acquainted with the commanding officer's intentions and his whereabouts, so as to be able to dispose of their scouts to the best advantage, and to send back information as expeditiously as possible.

Duties of the Firing Line.

The duties of the firing line are :—

1. To press forward at first so as to draw the fire of the defenders, and thus make them offer a target to the artillery ;
2. To continue to advance within effective range of the enemy, and from thence steadily and methodically push forward till within close range, covered by the fire of the artillery, machine-guns, and rifles of the supports.
3. To maintain a steadily increasing pressure along the whole of the enemy's front, and, particularly in the case of the decisive attack, to obtain in conjunction with the artillery and machine-guns a superiority of fire.
4. To watch for any weakening of the firing line or the movement of men to the rear, as this may be the moment for assault.

In a close country, and particularly in woods, the distance between the firing line and the support should seldom be more than 200 yards, while in open country, on the other hand, it should be considerably more, except in the case of a badly-armed enemy.

For principles of Fire Tactics, see p. 294.

Duties of the Support.

The duties of the supports are gradually to reinforce the firing line when it can by itself make no further progress.

In a close country, and particularly in woods, the distance between the supports and reserves should not exceed 200 yards, but in open country should be more.

Duties of the Reserves.

Battalion Reserves.

The duties of the battalion reserves, which will usually consist of at least one company, are :—

1. To reinforce the firing line when the whole of the supports have been thrown into it, so as, at close range, to bring it up to, and maintain it at, the maximum density of one rifle per yard ;
2. To reinforce the firing line at the moment of assault ;
3. To cover, whenever possible, by their long-range fire, the advance of the firing line ;
4. To protect the flanks from counter-attack ;
5. To bring, if possible, an oblique, or, better still, an enfilading fire to bear on that portion of the enemy's position which is being attacked by the firing line.

Brigade Reserves.

The duties of brigade reserves, which will usually consist of at least one complete battalion, are as follows :—

If the brigade is operating independently :

To act as the general reserve, and to carry out the duties specified below for a general reserve.

If the brigade is operating as part of a larger force :

To act as the local reserves, and to take over the duties of the battalion reserves, as detailed above, when these reserves have been absorbed in the firing line.

General Reserve.

The first and foremost duty of the general reserve is to make the decisive attack, but beside this it may be called on—

1. To meet any counter-attack;
2. To take up the pursuit if the attack is successful;
3. To form the rallying point if the attack is unsuccessful.

III. Signalling and Transmission of Messages.

Importance.

Since co-operation between the component parts of an attacking force is one of the first essentials for achieving success, signalling and transmission of messages is a matter of great importance.

Organisation.

The organisation of a system for the transmission of messages by signalling is outside the scope of this work.

Full particulars are given in the Signalling Manual.

For transmission of messages by other means, see p. 137.

Signals generally used in Skirmishing.

Signal.	To indicate.
1. Arm swung from rear to point below the shoulder	Advance or forward.
2. Arm circled above the head	Retire.
3. Hand raised in line with the shoulder, elbow bent	Quick time.
4. Clenched hand moved up and down between thigh and shoulder	Double.
5. Arm raised at full extent above head	Halt.
6. Body or horse turned in the required direction and arm extended in line with the shoulder	Incline.
7. Circular movement of the extended arm in line with the shoulder in the required direction	Wheel.
8. Two or three slight movements of the open hand towards the ground	Lie down.

Signal.	To indicate.
9. Two or three slight movements of the hand upwards from the ground	Rise up.
*10. Arm at full extent overhead and waved a few times slowly from side to side, the hand to be open and to come down as low as the hips on both sides of the body	Extend.
†11. Hand placed on top of the head, elbow to be square to the right or left, according to which hand is used.	Close or rally.
12. Arm swung from rear to point *above* the shoulders.	Reinforce.
13. Weapon held up above, and as if guarding, the head	Enemy in sight in small numbers.
14. As in 13, but weapon raised and lowered frequently	Enemy in sight in large numbers.
15. Weapon held up at full extent of arm, point or muzzle uppermost	No enemy in sight.

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* The number of paces to which men are to extend is to be communicated by word of mouth. This signal denotes extension from the centre. If the extension is to be made to the right, finish the signal by pointing to the right. If the extension is to be made to the left, finish the signal by pointing to the left.

† This signal denotes close on the centre. If it is desired to close on the right, finish the signal by pointing to the right. If the close is to be on the left, point on to the left.

N.B.—All signals should be made with whichever arm will show most clearly what is meant. Before making any of the above signals the commander will attract the attention of the skirmishers by blowing a short blast on his whistle.

IV. Preparation for Attack.

(*For form of Attack Orders and general principles for framing such Orders, see* p. 372.)

A.—RECONNAISSANCE.

Reconnaissance is the first preliminary of an attack, and the more thorough the reconnaissance the more likely is the attack to be successful. Time spent in reconnaissance is seldom wasted.

Reconnaissance, or at all events advanced reconnaissance, will usually be carried out by mounted troops; reconnaissance for attack by staff officers, and reconnaissance of the ground to the immediate front and flanks of the advancing infantry by the infantry themselves. Should there be no mounted troops, or should the ground be quite unsuitable for them, the whole duty of reconnaissance must of necessity fall on the infantry, and in this case they must act on the same principles as govern cavalry reconnaissance, which are set out on pp. 77–83, though the extent of their range, at all events to the flanks, must obviously be restricted. The value of personal reconnaissance by commanders cannot be over-estimated.

The strength and formation of the reconnoitring troops must be governed by the circumstances of the ground; but small officers' patrols in extended order, and consisting of picked scouts, will often be found convenient. Each small group of scouts will thoroughly search not only the ground through which they pass, but with their glasses the ground in front of them, and report their observations to their respective officers. Each officer must, of course, be careful to maintain touch with the patrol on either flank, so that no ground may be left unsearched. At least two men in the lightest marching order which is possible should accompany each patrol as despatch carriers.

As to the ordinary duties of infantry scouts, see p. 189.

B.—ASSEMBLY.

The position of assembly is some place out of range, if possible out of sight of the position to be attacked, where the troops who are to be engaged in the attack assemble and assume a preparatory formation. In the case of a large force there may be more than one position of assembly, or the position of assembly may include a wide area.

C.—FORMATIONS.

Formations when Advancing to Attack.

When advancing to attack, the usual formation for infantry will be :—

Where opposed to rifle fire only.	Where opposed to Field Artillery.	Where opposed to Heavy Batteries.	Formations.
yards. Beyond 2800	yards. Beyond 6000	yards. Beyond 10,000	Line or lines of battalions in lines of company columns with scouts out and at varying intervals and distances.
Between 2800 and 1400	Between 6000 and 3500	Between 10,000 and 4000	Lines of small columns such as company column with scouts out, except on an open plain and in very clear atmosphere, when lines of skirmishers may be necessary.
Between 1400 and 600	Between 3500 and 600	Between 4000 and 600	Lines of skirmishers. Scouts probably absorbed into firing line where opposed to rifle fire only.
Under 600	Under 600	Under 600	Firing line reinforced to bring it up to one rifle per yard.

In close country, or country where an extended view cannot be obtained, it will probably not be necessary to deploy into lines of skirmishers at such early stages as above indicated.

Formation of Reserves.

In order that they may be more readily handled immediately occasion requires, reserves, generally speaking, should be kept in as compact a formation as the nature of the ground will allow provided that they are ready to extend their front immediately.

Number of Rifles per yard at Beginning of Attack.

In the case of an enemy whose fighting qualities are approximately the same as our own, there will at the beginning of the attack be from two to three rifles per yard on the front on which the enemy is to be made to hold his ground. At the point where the decisive attack is to be delivered, a less number than three to five rifles per yard on the front on which this attack is to be delivered will rarely prove sufficient.

In an independent attack by a company or small body, the number need not be so great as in larger bodies, and may be reduced to, say, one rifle per two yards.

In deploying a battalion for the attack, the commander will decide how many companies to deploy in the front line—the number depending on the extent of front assigned to him, also on the fact that the smaller the front given to each company the more can the company be extended in depth, thus allowing all reinforcements of the firing line being provided as far and for as long as possible by the same company.

At the same time, no more companies than may be necessary should be extended, as it is most desirable to keep as large a force as possible in reserve, under the battalion commander's orders, and for as long as possible.

Formation of the Firing Line.

The company commander will decide as to the strength of his firing line and the formation of the remainder of his company ; in doing so he will usually take into consideration the extent of front assigned to his company.

The company should, where feasible, be extended in depth rather than in breadth, so as to allow of all reinforcements for the firing line being provided as far and for as long as possible from the same company, thus tending to delay the almost inevitable mixing of different units and consequent confusion in the attack. This course also enables the company commander to keep more of his men for a longer time under his own personal control.

With this method the usual course will be to extend complete squads in the first line of skirmishers and to reinforce each squad with the other squad of its section acting as support. When the scouts are unable to advance any farther, they will be reinforced from the first lines of skirmishers, and thus a firing line will gradually be built up with the scouts and the first line of skirmishers, being strengthened when necessary by men sent forward from the supports.

In close country affording cover, the supports and reserves would be kept in close order, probably in fours or company columns, for as long as possible, but in open country it might be necessary to extend the whole company in successive lines of skirmishers.

If the advancing troops come under artillery fire at long ranges, it will be best to advance quickly, so that it may be difficult for the artillery to range on them. It is often best to be some way behind cover, such as trees or hedges, rather than actually under them, since it is easier for artillery to range on prominent objects.

D.—CO-OPERATION WITH ARTILLERY.

In the Initial Stages of the Action.

In the initial, as in all, stages of an attack, the co-operation of infantry and artillery is essential if the most is to be made of both arms. All orders for the infantry attack must be communicated to the artillery commander.

The infantry by their advance will probably draw the fire of both the enemy's artillery and infantry, and directly a target is thus offered, the artillery will open on it. If this does not have the effect of driving the enemy from his position, it will at least help to keep down his fire during the infantry's advance.

It is pointed out in "Artillery Training" that it is most necessary to recognise that when once an attack has been launched, quick-firing guns cannot maintain a rapid continuous fire for any length of time. The two arms can therefore best co-operate by the artillery firing rapidly when they see their infantry endeavouring to press forward, and by the infantry making full use of these periods of intense artillery fire to gain a considerable amount of ground.

Signalling between Artillery and Infantry.

The further the infantry advance and the closer they come to the enemy's position, the more certain are they to come under fresh fire or to encounter fresh difficulties in which the fire of the artillery can help them. It is of the utmost importance therefore that commanders of bodies of infantry should keep in close touch with their covering artillery, informing them of any new obstacles to their advance and generally directing their attention to the points which offer the greatest danger to their progress. It should always be borne in mind by infantry commanders that, however excellent may be the observation which is maintained by artillery officers, it is almost impossible for them, in view of their position, to ascertain all the points to which their fire should be directed. Besides this, infantry can often help artillery by signalling to them the correctness or otherwise of their range. Artillery officers also may at times have most important information to communicate to the infantry.

It is essential therefore that arrangements should be made in the initial stages of the attack for practically continuous communication throughout, possibly by telephone and, if not, by some other means.

V. Carrying out the Attack.

Fire Tactics.

For Principles of Fire Tactics, see pp. 294–319.

Fighting for Different Tactical Points.

A battle will often resolve itself into a series of fights for different tactical points, each point as it is gained weakening the enemy's hold on others. The attack on each of these points will constitute a distinct engagement in itself, and may require a large number of both men and guns.

Advance to Close Range.

The firing line, after reaching the limit of effective fire, 1400 yards, will probably have to fight its way forward from one fire position to another until close range is reached. The movement from one position to another should be as quick, and the number of halts between the positions as few as possible. So long as there is adequate covering fire, the more men who advance at one time the better. It will usually be best for the firing line and the supports to advance at the same time, as the enemy is then more likely to distribute his fire than to concentrate it on one line. The firing line must gradually be built up, so that at the close range, and in good fire positions it may, in conjunction with artillery, and, if possible, covering fire from the rear, endeavour to obtain superiority of fire. Officers must, however, guard against premature reinforcement of the firing line at medium ranges, because, if they do so, it will entirely defeat the object of extended lines. The fire fight from these fire positions will probably last four hours, each force doing its utmost to wear down the opponents' powers of resistance and compel them to use up their reserves. At the point where the decisive attack is eventually launched numbers will facilitate a more rapid advance.

General Method of carrying out an Attack.

Advance by Rushes.

The best method of advancing to the attack, if the fire is hot, is by successive rushes, a half-section, a squad or half a squad at a time, according to the severity of the enemy's fire. As one half of the body rushes forward, the other half keeps up a hot fire until the first half has dropped under such cover as there is, and actually begun to fire. Then the second half must rush forward. With the Japanese, the second always halted when they came abreast of the first—never passed them. A fully armed man can cover about 25 yards in 5 seconds, the time which is usually required for an aimed shot.

The two halves should not be kept too close together in case the men who are rushing forward mask the fire of those lying down. If the enemy's fire is too hot to allow squads or even half-squads rushing at the same moment, men must rush out singly for a short distance straight to their front and drop at once, immediately opening fire, in which process they will be covered by the fire of their comrades. Troops extended to 3 paces are not much more vulnerable than troops extended to 5, and the firing line can be built up quicker. It is very important for each body of troops to maintain its proper direction, for if direction is lost, mutual support is impossible.

Entrenching during Attack.

If entrenching by infantry during an attack involves any diminution in its fire, it is only to be resorted to when further progress has for the moment become impossible. A determined advance must be made at the first possible moment.

A depression in the ground of even six inches will make a very considerable difference in a man's visibility, particularly if the earth which is taken out is piled in front of the man, as should always be done. The Japanese, whenever it was possible to dig in the ground, thus hastily entrenched themselves during their advance, and particularly in their last fire positions prior to the assault.

Some of the continental armies have also practised this, and the difference in visibility even at a short distance between a line, each man of which is lying in ever such a shallow entrenchment, and a line which is not entrenched at all, is very marked.

Another advantage of such entrenchments is that if the assault is unsuccessful the attacking force can fall back on them while they wait for reinforcements. If the advance of the firing line is successfully continued, these entrenchments can be occupied by the supports when the firing line has vacated them. When this is done, the entrenchments should be strengthened by the supports in preparation for a counter-attack.

Method of Entrenching in Attack.

The combined pick-shovel carried on the person by the Infantry, called "Implement, Intrenching, pattern 1908," of which 937 are carried by each battalion, is designed for use while lying down, and so is practically only intended to be used during the attack. Although it is easy to pick with this tool, it is difficult to pile up the earth with it The best method of using this tool is to work from rear to front, as by this means there is a "face" to work on, and a hollow for the disengaged arm is gradually provided which helps to provide cover for the digger. The disadvantage of this method is that the digger has to keep shifting the excavated earth forward, as it is not possible to throw it while lying down, and in order to do this the hands must be used to a large extent to push the earth forward.

Strengthening Tactical Points once Gained.

All tactical points, such as small woods, suitable buildings, bridges, etc., should immediately they have been gained be put into a state of defence. This will not only serve to protect them from recapture, but make them suitable supporting points for the attack.

Local reserves also will often be able to strengthen localities or fire positions which have been gained by the firing line.

Use of Cover during Advance.

When troops are actually on the move, advantage should be taken of all cover, such as folds in the ground, which shield the advance from view, provided that the proper direction is not lost. Woods and standing crops may also be utilised; but cover from view must never be mistaken for cover from fire, and it must be remembered that hedgerows and standing crops may prove very dangerous, owing to their forming an excellent mark for both artillery and rifle fire, while woods, if searched by high explosive shell, can be made practically untenable.

When, on the other hand, troops are halted, they should, as a general rule, only utilise such cover as will not prevent the free use of their rifles.

Co-operation with the Artillery.

The co-operation with the artillery to which reference has already been made (*vide* p. 197), should be continued throughout the attack, since the nearer the firing line gets to the enemy the more necessary does the support of the artillery become, and the greater the difficulties of the infantry the closer must be the support of the artillery.

Every advantage should be taken by the infantry of the bursts of rapid fire by the quick-firing artillery for making quick progress to the front.

When the infantry advance to the decisive attack, it is stated that every available gun should be concentrated against its objective and continued until it is impossible for the artillery to distinguish between their own and the enemy's infantry. A portion of the artillery will be pushed forward to close artillery range, so as to be ready to meet any counter-attack or render the infantry any assistance they may require.

When the fire of the guns is masked, the guns will re-open at an increased elevation, so as to prevent the advance of reinforcements.

Co-operation between Different Portions of Attacking Line.

In the event of any one portion of the force which is to carry through the decisive attack being unable to advance, other portions of the line should by their fire co-operate in beating down the fire which is causing the obstacle to the advance.

Improvement of Conditions during Night-time.

If superiority of fire cannot be obtained in one day, it will be necessary during the night to hold the positions already gained, to bring up more artillery, and if possible to relieve the firing line with fresh troops, possibly also to make some further advance under cover of darkness. Advantage should also be taken to improve, if need be, the cover of the firing line.

Local Assault.

Any opportunity for closing with the enemy at points other than that chosen for the decisive attack should at once be seized and a local assault delivered. The result of a successful assault may be far-reaching, and will at all events weaken the enemy's hold on other positions.

The assault should be carried out as indicated on p. 204.

Steps in the Event of a Counter-Attack.

Should a counter-attack be made during the attack, the troops threatened should take up a defensive attitude and attempt to gain time. It is stated that as a rule the most effective counter-measure will be to press the decisive attack with renewed vigour, since success at the vital point will mean ultimate success at all points.

THE DECISIVE ATTACK.

Though in some cases the objective for the decisive attack will be clear almost from the first, it will often be the case that a commander cannot decide on a suitable objective until after long and severe fighting. It is laid down that in choosing an objective a commander should consider whether he can develop against it the full power of his artillery. A locality which may at first sight appear easy of access to the infantry may prove costly to attack if it does not lend itself to the application of the concentrated fire of artillery; while on the other hand, localities which present difficulties to the infantry alone may, if concentrated and enfilade fire is brought to bear, be carried with comparatively little loss.

Launching Decisive Attack.

The launching of the decisive attack must be the signal for the greatest possible pressure being applied along the whole of the enemy's front. Every man and gun must co-operate to complete the enemy's overthrow.

Advance to Close Range.

The troops will press forward to close range in the same manner as already explained on p. 199, except that the advance, owing to superior numbers and the necessity for striking quickly, will usually be carried out with shorter halts.

The Assault.

Just before the assault, the heaviest possible fire, both artillery and rifle, will be concentrated on that portion of the enemy's front against which the decisive attack is launched.

Directly it becomes evident, either by the slackening of the enemy's fire or the beginning of a movement to the rear, that superiority of fire has been gained, the firing line should advance to the assault.

Obstacles may have to be overcome, and steps must be taken for effecting this. The Japanese very often detailed engineers to precede the firing line.

The men should be on their guard against any false orders to retire, which may be shouted from the enemy's position or from irresponsible quarters.

Magazines should be fully charged and bayonets fixed just before making the final rush. The whole line should then spring forward to the assault, bugles sounding, pipes playing and all men cheering.

In the final rush both the Japanese and Russians often fired as they dashed in, the object being not only to disturb the defenders' aim, but if possible to make them quit the trenches. Of the various ways of shooting while dashing forward, that of firing from the hip, with the rifle aligned on the trenches, is probably the best.

VI. Entrenching a Position when Gained.

After the Position is Carried.

If the position is carried, the most rapid fire should be poured on the retreating enemy, so as to prevent him rallying for a counter-attack. Fire control on such occasions is essential.

Entrenching Position.

When once a position has been gained, it is essential to improve it in case it may have to be held for a considerable time against a larger force—Spion Kop may be quoted as an example of the results of not taking this precaution. Though it will usually not be found practicable for men to dig standing up in daylight, still, as shown by the Japanese in Manchuria, shallow trenches may be dug by men lying down if they have the necessary tools. The position may often be improved in other ways; for instance, where there are stones, they may be rolled together to form a screen behind which to fire, while if the country is enclosed with hedges and ditches, the hedges can be made to form a screen at all events to hide the position of each man, and the ditches can be utilised to give cover from bullets. If there are no ditches, the men must scrape up sufficient earth to afford cover while lying down.

Should it be necessary to hold the position until the following day, regular entrenchments may of course be constructed under cover of darkness.

As to form of fire trenches, see pp. 717–724 and Plates 82 and 83.

Pursuit.

If the enemy retreats, the Infantry will at once re-form, replenish their ammunition, and prepare to follow directly they receive orders. The pursuit will be taken up immediately by the Artillery and Cavalry, probably with a view to cutting off the retreat of the enemy, to attacking him in flank, capturing his artillery, intercepting and surrounding such bodies of men as they are able, compelling him to abandon his transport, and at the same time keeping the retreating masses on the run. In this the Infantry must co-operate to the utmost of their powers, pressing after him so that if the Cavalry can at any place intercept or delay him the Infantry may be there to join in the attack.

VII. Retreat.

If the attack fails and a renewed attack is useless and the troops are unable to hold the ground from which the attack was delivered, a retreat must be undertaken. If it is undertaken without any arrangements having been made beforehand, and with the consequent uncertainty as to the rallying points, the line of retreat, or the early withdrawal of the baggage columns, the result may be disastrous. Before, therefore, troops ever embark on an attack, the arrangements for retreat in case of failure should be carefully thought out and, when a retreat appears inevitable, communicated confidentially to commanders of units.

One of the primary requirements for a safe retreat is that the baggage columns should at an early stage be withdrawn to the rear. Should a retreat become necessary, the baggage columns, if they have been left a sufficient distance in the rear, will obviously have a considerable start of the combatant troops.

If a retreat is contemplated, the commander of the baggage columns should of course be at once informed so that he may immediately begin the retirement. The main object at which he has to aim is to leave the roads clear for the fighting troops so that their movements may not be impeded. Some of the most disastrous retreats in history have been when the fighting troops have been driven on to the slowly retreating lines of transport. Whether a force is large or small, the same principle applies—the transport must be removed at an early stage.

As they retire, supplies of food and ammunition should be left by the transport columns alongside the roads by which the fighting troops will withdraw.

Rallying Position.

A rallying position will have been carefully chosen by the commander of the force before the attack is launched. It is laid down that it should never be so close to the battlefield as to come at once under the enemy's fire. The position should be occupied as soon as possible by artillery and by complete infantry units. The mounted troops and a strong force of artillery, supported by a rear guard of infantry, will meanwhile check the enemy's advance, so as to enable the remainder of the force to move to the rallying point and there reorganise.

It is pointed out that the greatest danger during a retirement is often from the flanks, and accordingly flank guards should occupy any ground which command the line of retreat, so as to hold at bay the enemy's cavalry and horse artillery, who will probably endeavour to harass and, if possible, intercept the retiring force.

Rear Guard Fighting.

For general principles of Rear Guard Fighting, see p. 32.

Orders for a Retreat.

For form of Orders for a Retreat, see p. 385.

For form of Rear Guard Orders, see p. 387.

TABLE OF RANGES.

Terms applied to ranges.	Rifle.	Field Artillery.	Heavy Batteries.
	Yards.	Yards.	Yards.
Distant . .	2,800 to 2,000	6,500 to 5,000	10,000 to 6,500
Long . .	2,000 to 1,400	5,000 to 4,000	6,500 to 5,000
Effective . .	1,400 to 600	4,000 to 2,500	5,000 to 2,500
Close . .	600 and under.	2,500 and under.	2,500 and under.

The width of the area of ground struck by the bullets of an effective shrapnel is about 25 yards.

The limit of the forward effect of shrapnel at effective range is about 100 yards.

The radius of the explosion of a high explosive shell is about 25 yards.

ATTACK BY EITHER MOUNTED TROOPS OR INFANTRY.

Attack on Outposts.

Purposes for which an Attack may be Ordered.

Generally speaking, there may be said to be four purposes for which an attack on an outpost line may be ordered :—

(1) To find the weakest point in the line, prior to general attack ;
(2) To force the line ;
(3) To turn the flank of the line ;
(4) To hold the line engaged ;

For the first three of these purposes it is very desirable, while for the fourth it is at least advantageous, that the exact outpost formation adopted by the enemy should be known.

General Formation of Outposts of Foreign Armies.

In other armies, as in the British Army, the strength of all outposts, as compared with the main body, depends to a great extent on the position and circumstances of the force to be guarded, for instance, whether it is a besieging or a beleaguered army, an army encamped for some days in one position, an army halted merely for the night, or an army which bivouacs on the field of battle, and which is to renew the fight on the next day.

In the case of a besieging or beleaguered army, or an army encamped for some days in one position, the outposts in foreign armies may, when sufficient men are available, consist of :—

(1) Cavalry reconnoitring patrols ;
(2) Cavalry posts, consisting either of fixed posts or advanced squadrons ;
(3) Infantry sentries (usually double) ;
(4) Officers' or non-commissioned officers' posts ;
(5) Visiting patrols ;
(6) Piquets ;
(7) Outpost companies, consisting of infantry ;

and, in the case of divisions or larger bodies,

(8) A main body of outposts, consisting of infantry, with possibly some artillery and cavalry.

In the case of an army halting only for the night, the outposts may consist merely of sentries and piquets, while in the case of an army which bivouacs on the battlefield, to renew the fight next day, the outpost lines may be composed merely of sentries.

Instructions given to Outposts.

To illustrate the tactics which may be adopted in the defence of an outpost line, one may refer to the general instructions given in foreign armies, which are, speaking generally, as follows :—

(1) The piquets either to advance and fight on the line of sentries or posts, or these sentries and posts to retire on the piquets, who will occupy a previously selected position ;

(2) If the piquets are compelled to retire, that they do so on a broad front ;
(3) To bring up the supports to any threatened portion of the outpost line, or to unite the piquets in a defensive position ;
(4) To use those portions of the outpost line which are not threatened, to assist those which are pressed ;
(5) To use the outpost reserve to delay the advance until the main body is ready.

Methods of Attack under Various Circumstances.

To find Weakest Point in Line.

An attack for the purpose of finding the weakest point in the line is more in the nature of a reconnaissance in force. An attack may become necessary if the scouts are unable to gain any material information as to the strength and formation and the weakest point of the enemy's line owing to the lie of the ground or the vigilance of the enemy's outposts.

The main principle in such an operation is to press the attack all along the line at the same time, in order to prevent the enemy thinning his line at one point, and thereby reinforcing some other which is harder pressed. Each portion of the attacking line should therefore maintain a steady forward pressure.

If the whole outpost line is not strong enough to resist the attack, one or more points will probably give way slightly, and then be actually driven in, thus disclosing the weak points.

Whether the attack is then to be pressed, or the troops are to withdraw depends, of course, on whether or not a general attack is immediately to follow.

To force the Line.

When the purpose is to force the line of outposts, surprise and quickness of attack are important factors in ensuring success. Every minute gained by the outposts is of value to the main body, and therefore rapidity of attack is very advantageous. If surprised, his sentries may be driven in, the posts forced back on piquets, the piquets on supports, and an avenue may possibly be opened to the enemy's main body before he has had time to establish himself firmly on his prepared line of defence.

In order not to lose any of the advantages of surprise, any patrols met with in the advance should, if possible, be captured without any firing. If the attacking line is preceded by scouts, they may locate these patrols and assist in surrounding them.

To turn the Flank of the Line.

When, however, the immediate purpose is to turn the flank of the outpost line, the seizure of good positions is one of the first points to achieve. Positions should be selected from which an enfilading or, better still, a reverse fire can be brought to bear on the outpost line. This flank attack will probably be made in conjunction with a frontal attack by infantry. If he is taken in reverse, as well as in front, it will be very difficult for the enemy to hold any position for long. On his falling back, the attacking force should persist in attempting to take him in flank and reverse, until the whole of one flank is rolled up. When this is done, his main position will be in danger.

The flanks of outposts, if not resting on a naturally strong position, will usually be guarded by some strong detached post, and provision should therefore be made at the beginning of the movement for surrounding or driving in this post or at least holding it engaged. Which of these three courses to adopt must depend on circumstances.

To hold the Outpost Line engaged.

In order to hold the outpost line engaged—just as in seeking for the weakest point in the line—the principle is to press the attack all along at the same time, and so prevent any portion of the line being thinned to help any other portion. Experience has shown that it is necessary to attack with vigour all along the line if the enemy is to be prevented from thinning his line at places, in order to reinforce it at others.

This containing force must at all times be ready to press in, should the order be given to do so, as might be the case when a general advance is planned.

When waiting for an order, it is important that an officer or non-commissioned officer should think out his line of advance or retreat so as to be ready to move at a moment's notice.

Attack on an Advanced Guard.

General Formation and Strength of Advanced Guards of Foreign Armies.

Apart from any independent cavalry who may be employed for some specific purpose, the strength of the advanced guard of an advancing force varies, in foreign armies, from as much as one-third to one-eighth of the whole force.

When the main body consists of at least a division, the advanced guard is usually composed of:—

(1) Advanced Guard Cavalry, Advanced Party or Points. the latter consisting usually of an officer and a few men; there may also be infantry points between the cavalry points and the vanguard;

(2) Vanguard; consisting usually of Cavalry, some Infantry, and, possibly, Engineers;

(3) Main Guard of the Advanced Guard, consisting usually of Infantry, Artillery, and Engineers, as well perhaps as a balloon detachment.

Distance ahead of Main Body.

The distance between the head of the advanced guard and the main body varies in different armies and under different circumstances from a distance, say, equivalent to the depth of the main body on the line of march to about 4,000 yards, but generally speaking it is governed by the rule that the advanced guard must protect the main body from surprise, and in addition give it time to assume a fighting formation, as well as to clear away any small force which might otherwise check the advance of the main body. It must, on the other hand, only be sufficiently forward to ensure the possibility of the main body being able to attack at the right moment (German Army).

Therefore, in forces smaller than a division, the distance will probably be less than 4,000 yards, while in very much larger ones, it will usually be considerably more.

Main Objects of Advanced Guards.

Speaking generally, the main objects of advanced guards in foreign armies are stated to be the following, though the ability to carry them out will depend very much on the size both of the advanced guards and of the columns to which they are attached :—

(1) To effect a thorough reconnaissance for a distance of three to five miles ahead of the main body ;
(2) To locate the position of the cavalry of the opposing force should it be within touch ;
(3) To prevent the main body against surprise ;
(4) To prevent any interruption of the march of the main body ;
(5) In the event of the opposing force being discovered in strength, or attacking in force, to protect the main body until it has time to assume battle formation.

Main Aims of Force attacking an Advanced Guard.

Speaking generally, the main aims of the troops attacking another advanced guard will be the following :—

(1) To seize any important tactical points on the enemy's line of march, such as commanding hills, defiles, etc., which can be held until artillery are brought up ;

(2) To dispose of any patrols, cavalry, or infantry points which may have been thrown forward for reconnaissance. This must be done as quietly and expeditiously as possible, in order not to lessen the chance of surprising the advanced guard ;

(3) If a force of the enemy is unexpectedly met with, to push back his advanced troops, to gain ground for the main body to deploy, and at the same time to hamper the enemy's deployment, but without interfering with the commander's liberty of action ;

(4) To attempt to defeat the advanced guard in detail before it can receive effective support from the main body ;

(5) To choose ground where the enemy's advanced guard will be at a disadvantage, even if it may happen eventually that the attacking force is compelled to assume the *rôle* of defenders owing to the arrival of the enemy's supports. To choose ground also which cannot be easily outflanked by the enemy's main body ;

(6) To roll up the flank of the advanced guard ;

(7) To destroy any bridges, boats, etc., which the enemy might use in his advance, assuming that it is necessary to delay him at all costs.

If, on the other hand, it is desired merely to ascertain the weakest point in his front, then :—

To press the attack all along the front at the same time, so as to prevent him reinforcing a point which is harder pressed by thinning it at another.

Attack on Flank Guard.

Composition and Formation of Flank Guards.

Though the formation adopted in foreign armies varies considerably according to circumstances, the rule of having flank guards is generally recognised.

When its security is not threatened, the flank may be watched merely by patrols.

When, however, the flank of a force is exposed to the enemy, the strength and composition of the flank guard will be determined by the probable degree of danger and the nature of the country.

If the cavalry are not in sufficient numbers to provide an appreciable portion of the flank guard, they will usually be employed in reconnoitring, besides keeping up communication between different portions of the flank guard and the main body.

When the flank guard is a large one, it may in some cases be itself protected on the front, outer flank and rear by smaller bodies and by cavalry points consisting of a few men thrown forward for observation.

As a general rule, when the flank guard is halted for any length of time, the principles laid down for outposts will be adopted.

Main Aims of Force attacking a Flank Guard.

Speaking generally, the main aims of troops attacking a flank guard will be the following :—

(1) To break through the flank guard and seize any important points, such as hills commanding the line of route of the main body, holding them until artillery can be brought up ;

(2) To select ground for the attack where the main body and their transport are to some extent hemmed in, such as in a defile or narrow valley, and where even infantry would have difficulty in deploying for the defence ;

(3) To surprise the column, so that the confusion caused by the sudden fire may be greater.

Attack on Rear Guard.

General Formation adopted by Foreign Armies.

The rear guard of foreign armies will, generally speaking, onsist of :—

(1) Rear guard cavalry, and, possibly, horse artillery;
(2) Support composed of infantry, artillery, and possibly engineers;
(3) Main body of rear guard, consisting, principally, of infantry, with possibly some artillery;

and probably

(4) Flanking parties consisting of cavalry and artillery.

Occasion of Attack.

The usual occasion for an attack on the rear guard is when the enemy, in full retreat, is making for some point where he can either receive reinforcements or take up a strong defensive position.

Aims of the Retreating Force.

The great aim of the retreating force will invariably be to gain time, in which the troops may regain their *morale* and reach some point where they will either be reinforced or be enabled to take up a defensive position.

With this end in view he will probably:—

(1) Employ a strong rear guard, who will endeavour to hold successive rear-guard positions;
(2) Guard the flanks of his rear guard with cavalry and artillery;
(3) Use his guns to compel the attackers to deploy as soon, and as far from the rear guard positions as possible;
(4) Lay ambushes with the idea of compelling the attackers to move with caution;
(5) Endeavour to destroy bridges, block roads, burn boats, wire fords; do anything, in fact, to delay the pursuing force.

Main Aims of the Pursuing Force.

In the case of a very large force, such as an army, retreating, the rear guard may be of great strength. The use to which the mounted troops of the pursuing force are put will depend upon the exigencies of the moment, but, speaking generally, the main aims of the pursuing force, apart from any parallel pursuit which may be instituted, will be as follows :—

(1) To roll up the flanks of the enemy's rear guard ;
(2) To get between his rear guard and main body, and harass, or even capture, a portion of it ;
(3) If unable to get in between the rear guard and the main body, to press the rear guard as much as possible, by driving and manœuvring them out of each successive rear guard position, in an attempt to force them back on the main body, thus adding to the confusion of the retreat, and giving opportunities for fire to be poured on the main body ;
(4) To hustle the rear guard as much as possible, when in the vicinity of any bridges, etc., which it is possible to destroy, never giving them time to carry out any demolitions ;
(5) To act with great boldness, accepting risks which at other times would not be justifiable.

Attack on Convoys.

General Principles.

Even though the attacking force may be inferior in numbers to the escort, a convoy may often be successfully attacked. The aim in such an attack is to capture the convoy intact, or first to kill the transport animals, thus rendering it immobile, and then to destroy it. That part of the route should be chosen for the attack where the escort will be at the most disadvantage, such as a defile, and, with this end in view, surprise should always be aimed at in order to make the attack doubly effective. Feints can be made at various points, but when once the main attack has been launched, it should be pressed home before the defenders have time to concentrate against it, or, at any rate, before it is possible for the transport to close up and laager.

Attack in Defile by Small Body.

In the event of a small patrol discovering a convoy, two despatch riders should be immediately sent back to report. If the patrol is not strong enough to capture the convoy, they should wait till it reaches a defile, ford, or difficult portion of the road. If, in view of the surrounding circumstances, it appears better to attempt to stop the convoy or delay it in order to gain time, rather than to watch it and wait for reinforcements, a sudden fire poured on the leading animals of the transport is probably the best means of causing a block.

Attack on Mechanical Transport.

Attack on Mechanical Transport Convoys should, wherever possible, be undertaken at points where convoys have to negotiate up gradients, as the speed is necessarily slow and laboured, and mechanically propelled vehicles only reverse with difficulty. Other suitable points are on narrow roads where it is impossible to reverse or make a detour.

Attack on Bridge or Ford.

Method of Attack.

Should the defenders of a bridge or ford be in such a position, that they can easily bring a converging fire on the crossing point, every attempt should be made to outflank their position. If the river winds towards the enemy's flank, it may be possible, without even crossing the river, to bring an enfilading fire to bear on him, and so make the main defensive position in front of the ford or bridge untenable. But if the course of the river is not suitable, the outflanking movement will have to be effected by a body of men crossing the river at some favourable point, probably at a distance. In the meantime, a small body of men should keep the enemy's attention riveted on the bridge or ford, while yet another small body can make a feint at crossing the river some distance in the opposite direction to the main outflanking body.

Crossing a Bridge under Fire.

If a bridge has to be crossed under fire, as close an inspection of it as possible should be made with glasses, so as to ascertain if there is any sign of its having been prepared for demolition. (For methods of destroying different classes of bridges see pp. 685–699.) At the same time, it must be recognised that the charges may have been so placed as not to be visible from a distance. If it is suspected that a bridge has been prepared for demolition, it is not a bad plan to drive some horses or cattle across it, as some forms of land mines, which might be placed at the entrance to a bridge, may be exploded in this way.

If it is necessary to carry the bridge or ford by assault, let the covering party concentrate the heaviest fire possible on the defenders just prior to, and during, the charge of the assaulting party.

Attack on Woods.

Methods of Attack.

If an attack is to be made on a wood, the object will be, of course, to gain an entrance, if possible by a flank movement. If a flank movement is not possible, it must be gained by a frontal assault. If a flank movement is possible, it will usually be well, unless the enemy can be taken completely by surprise, for a portion of the force while the movement is taking place to hold the defender's attention by fire on his front. If ingress is strongly opposed, a hot fire should be concentrated on the point or points which it is intended to attack, and then, if necessary, they must be rushed. When once an entrance has been effected, the enemy must be driven from the wood by sheer boldness in attack.

Reconnaissance and Flank Attack by Mounted Troops in conjunction with Infantry Main Attack.

Compass bearings should always be taken before entering a very large wood.

If engaged with infantry in the attack on large woods, the mounted troops may be employed in reconnoitring the enemy's position to discover any spot where an entrance can be effected, or, if the whole of the wood is strongly held, the weakest point in his line must be located.

A feint by the dismounted men may often cause the enemy to withdraw some of his forces from the point of real attack. As an instance of the effectivenesss of such tactics, it is well known that in the American Civil War, where there was a great deal of forest fighting, General Jackson's cavalry did invaluable work by reconnoitring and demonstrating in this manner.

After Entrance Effected.

When once the wood is entered, boldness and energy in attack nearly always make up for smallness in numbers. The enemy should never know on which flank he will be taken next, and should be hustled from point to point about the wood in the endeavour to make him vacate it. Seeing that in pressing through thick wood large gaps are often formed in the ranks, the men should be rallied before they advance beyond it, and a sharp look-out must be kept for any defensive positions or ambushes which may have been prepared just outside the wood.

Whenever a path is crossed, lateral communication should be re-established before the advance is resumed.

DEFENCE AND COUNTER-ATTACK.

MOUNTED TROOPS AND INFANTRY.

I. General Principles.

A. PRELIMINARY.

Disadvantages of Assuming the Defensive.

The assumption of a defensive attitude entails the surrender of initiative, as well as the abandonment of the choice of time and the advantage of manœurving. It compels the defender to regulate his movements by those of his opponent, and to ward off one blow before he can strike back another.

No natural or artificial strength of position will, it is stated, of itself, compensate for loss of initiative when an enemy has both time and liberty to manœuvre.

A commander may, however, under certain circumstances decide to occupy a position with a view to using it as a pivot of manœuvre and striking a decisive blow at the first opportunity.

The defence which is considered in the following pages is the defence which is merely the precursor of the counter-attack which is to be struck directly an opportunity offers. The action in which defence for the time being is the sole aim and object is dealt with under the head of "Delaying Action" (p. 254).

B. CHOICE OF POSITION.

A commander may be able to occupy a position of his own choosing in which the enemy is practically bound to attack him, or he may be forced, owing to loss of initiative or to sudden attack, to assume a defensive attitude wherever he may find himself.

If it is open to him to choose a position, the following are the chief requisites :—

1. The position should be such as to require as small a number as possible for its actual occupation, thus leaving as large a force as possible for the assumption of the offensive, *i.e.* the counter-attack. It is laid down that, if the frontage occupied in battle is so great as to reduce the force kept in hand for the ultimate assumption of the offensive much below half the total force available, the position may be considered as too extended for decisive action on the part of the defence ;
2. A clear field of fire and ground where the artillery and infantry can act in co-operation. It is laid down that it is better for the defence to have moderate facilities

for fire and the attack none, than for the defence to have good facilities and the attack better.

3. Sufficient depth and good lateral communications under cover in rear of the entrenchments, so as to allow of the passage of troops to every point.
4. Favourable ground, on which all arms can co-operate, for the decisive counter-attack, and where the counter-attack can be covered by heavy rifle and artillery fire.
5. Flanks resting on ground which is naturally strong, or can be made so artificially.
6. Water.

The following, though it should in no way be a deciding factor, must be borne in mind.

7. Good means of retreat—if possible—several roads or tracks, and a strong rallying position in rear.

II. Command.

Position of Commanders.

As in attack, a commander will, generally speaking, take up his position with a view :—

1. To obtain an extensive view ;
2. To be central so as to facilitate—
    - (*a*) The issue of orders ;
    - (*b*) The receipt of reports.

Subordinate commanders will take up the most suitable position from which—

1. To supervise their commands ;
2. To keep the enemy in view ;
3. To receive orders ;
4. To transmit orders to subordinates.

Where there are not less than two officers with a squadron or company, one at least should be with the firing line and in a position where he can best control its fire.

Duties carried out by an Independent Commander.

Generally speaking, the duties of a commander of a large or small force acting independently are :—

1. To decide on all the points specified on pp. 380–381, and issue orders respecting them ;
2. To take up a central position as specified above ;
3. To make preparations for the delivery of the counter-attack, and to retain in hand for that purpose the general reserve or other troops detailed for the counter-attack.
4. To make provision for his line of retreat.

Duties carried out by O. C. Infantry Battalions.

The duties, as laid down, of an officer commanding an infantry battalion or other force holding a portion of the defensive line are :—

1. To reconnoitre the ground in front of that portion of the position which he is to hold ;
2. To tell off his troops into a firing line, supports and reserve;
3. To divide the portion of the line for which he is responsible between the officers commanding the companies in the firing line and supports and to retain the reserve in his own hand ;
4. To take up a central position as specified above ;
5. To keep in communication with his superior commander by either the field telegraph, telephone, signallers or despatch riders, and to report all movements of the enemy;
6. To keep in communication with the troops on both flanks, and to maintain communication from front to rear ;
7. To choose a central position for the reserve ammunition of the battalion ;
8. To make provision for the treatment of all casualties and their removal to the dressing station of the bearer division ;
9. If in command of section of the defence, to watch for suitable opportunities for local counter-attack ;

10. In case a retreat becomes necessary, to make himself acquainted with the best line for his force to take in order to reach the rallying position.

Decentralisation of Command.

See p. 183.

Duties of Company Commanders holding a Portion of the Position.

When companies or other bodies of similar strength are acting as portions of larger bodies, and are holding a portion of the position, and are not merely in reserve, the duties of their commanders will be :—

1. To occupy the ground allotted to them to the best advantage ;
2. To detail men for the firing line and supports ;
3. To direct the fire of his company. (See Fire Direction p. 297.)
4. To keep in communication with his superior commander either by signallers or messengers and to report all movements of the enemy ;
5. To keep up communication with the unit on either flank or, if in command of a unit on the flank, to make provision for watching that flank ;
6. To make arrangements for the supply of fresh ammunition ;
7. To think out the line which he will probably take—
    (*a*) In the event of a local counter-attack ;
    (*b*) In the event of retreat ;
8. To watch for and report immediately to his superior commander any opportunities for local counter-attack and, if delivered, to lead his men.

Duties of Platoon Commanders.

The duties of platoon commanders are :—

1. To see that each section occupies to the best advantage the ground which is allotted to it ;

2. To take the ranges to several prominent objects on the probable line of the enemy's advance ;
3. If there is any hidden ground immediately in front of the position, to make such provision as is possible for watching it closely, and arrange to have it covered by fire from another unit ;
4. To control the fire of their platoons. (See Fire Direction, p. 297.)
5. To keep touch with the unit on either flank, or if in command of a platoon on the flank to detail scouts to watch the flank ;
6. To make arrangements for the supply of fresh ammunition, and to see that the supply of each section is maintained, and to distribute the ammunition of any dead or wounded men ;
7. To ascertain the position of the dressing station ;
8. To see that the firing line is kept up to strength, the casualties being replaced from the support ;
9. To watch for and report immediately to his company officer all movements of the enemy and any opportunity for local counter-attack.

Duties of Section or Squad Leaders.

The duties of section or squad leaders are :—

1. To see that every man is in the best position to use the rifle effectively and makes the best use of any cover.
2. To see that every man has :
    - (*a*) Plenty of ammunition at the beginning of the action and keeps it replenished whenever required ;
    - (*b*) Water in his water-bottle ;
3. To control the fire of their men. (See Fire Direction, p. 297.)

III. Division and Distribution of Force and Duties of Different Arms.

A. DIVISION OF THE FORCE AND DUTIES OF EACH ARM.

(a) *Duties of Mounted Troops.*

Where there are sufficient infantry for the defence, the greater portion of the mounted troops who are not acting independently, *i.e.* the Protective and Divisional Cavalry, may be employed in the following duties during an action, the remainder being retained with the reserve :—

1. To discover the direction of the march and the strength of the approaching columns ;
2. In conjunction possibly with other arms to screen the main position, to mislead the enemy as to its exact situation and extent, to induce him to deploy prematurely and to fatigue his troops in searching for well-concealed flanks ;
3. To watch for and prevent any turning or out-flanking movement ;
4. To take up positions of readiness, usually on the flanks, and to keep in touch with the course of the battle and seize any opportunity which arises for carrying out the commander's instructions ;
5. To help by its action to create the opportunity for launching the counter-attack.

And in the case of cavalry attached to the general reserve :—

6. To watch the flanks during the counter-attack.

(b) *Duties of Artillery.*

1. To take up a position so as to command the enemy's lines of approach and probable artillery positions ;
2. If the enemy's artillery is very superior, to disperse and conceal the guns so that a converging fire can be brought to bear on the probable lines of advance ;
3. To prepare alternative emplacements for guns, including

positions from which, during the later stages of the action, direct fire can be employed ;

4. To take ranges to all positions which the enemy might occupy ;
5. To co-operate with the infantry in crushing the attack as it develops, and particularly to prevent him seizing strong tactical points ;
6. In enclosed or wooded country where it may be impossible to obtain a good field of fire, to shell areas of ground or localities known to be occupied by the enemy;
7. To prevent the enemy's guns coming into action at short range ;
8. To support local counter-attacks ;
9. If the enemy's attack is pressed home, to occupy direct fire positions and to re-open at all costs.
10. To support the decisive counter-attack with fire from the main position, all the guns possible being brought to bear on the enemy and his reserves when their position becomes known ;
11. To detail a portion of the guns to accompany the decisive counter-attack so as to come into action at close artillery-range.

(*c*) *Duties of Infantry.*

To the infantry will fall the main duty of repelling the attack, of delivering the local counter-attacks and carrying through the decisive counter-attack.

B. DISTRIBUTION OF THE FORCE.

Distribution into Firing Line, Supports and Reserves.

Mounted troops or infantry, whether of the strength of a regiment or battalion, brigade or larger force, are formed into three bodies distributed in depth :—

The first, for the defence of the entrenchments, is divided into— (*a*) Firing Line ; (*b*) Supports.

The second, namely, the Local Reserve, which is used to deliver local counter-attacks. It is not to be used to reinforce the firing line.

The third, namely, the General Reserve, which remains in the hands of the commander of the whole force, to deliver the decisive counter-attack.

Proportionate Strength of the Firing Line, Supports and Reserves.

It is laid down that the strength of the General Reserve should not be much below half of the total force which is available.

The strength of the Local Reserve should be approximately the same as the firing line and supports taken together.

As regards the firing line, not more than one man per yard should be employed in one line, but in a strong position, or where it can be made strong, the firing line need not be so dense. The strength of the supports, whose duty it is to replace casualties and infuse fresh vigour into the firing line, will vary with the probable conditions of the battle from one-fifth to one-half of the firing-line.

IV. Preparations for Defence.

A. RECONNAISSANCE.

Reconnaissance before Attack.

It is obvious that when taking up a position for defence every effort should be at once made to obtain the earliest news of the enemy's advance, his probable line of attack, and if possible his strength and the position of his reserves.

The reconnaissance, during the period of the enemy's advance, will probably be carried out to a great extent by reconnoitring patrols and scouts, supported probably by some larger bodies of mounted troops.

These patrols will carry out their work in practically the same manner as patrols sent out from Outposts (see pages 50–55).

In a dry country, clouds of dust will often indicate the advance of troops who cannot actually be seen.

Reconnaissance of the Position by the Commander.

The commander of the force which is acting on the defensive should always endeavour to make a personal reconnaissance of the position, and if possible from the ground whence the attack will be delivered. If he is unable to make a complete reconnaissance himself, he should have sketches and reports made of any portions of it which he has not examined.

The following are the chief points which should be noted :—

1. The best line to be held by the infantry ;
2. The division of the front into sections, no section being too large for a commander to hold ;
3. The distribution of troops along the positions, and those sections which must be strongly held, and those which may be lightly held ;
4. The best means of protecting the flanks ;
5. The best positions for the artillery ;
6. The probable lines of the enemy's advance ;
7. The probable positions of the enemy's artillery ;
8. Any points the loss of which would exert a decisive influence on the issue of the fight ;
9. The most favourable ground for counter-attack ;
10. Ground to be occupied by the general reserve, the cavalry, and the other mounted troops ;
11. The best method of improving lateral communications ;
12. Positions to be occupied in case of retreat.

(For form of Defence Orders, see p. 377.)

Reconnaissance during Defence.

Arrangements must always be made by the commander for the continuous observance of the enemy's movements during the progress of the attack. In large forces this will be carried out by staff officers who are informed of the commander's intentions, and in smaller forces by other officers specially detailed. In any case, they will employ patrols to work round the enemy's flanks, and if possible his rear, and endeavour to ascertain any important changes in the enemy's dispositions as well as the position of his reserves. They must do their utmost to discover, and as early as possible, where he intends to make his main attack.

B. OCCUPATION OF THE POSITION.

It is laid down that though the extent of the ground held, when the direction of the enemy's advance is definitely known, must be limited strictly by the numbers available, yet the extent of ground reconnoitred and prepared for defence beforehand may be much larger and should admit the various alternative distributions of the force so as to meet the various courses of action which are open to the enemy.

When preparing a position for defence, the following must be provided for :—

1. The thorough reconnaissance of the ground in the vicinity of the position ;
2. The division of the front into sections ;
3. The detailing of complete units for the defence of woods or other special tactical points :
4. The protection of the flanks ;
5. The clearing of the ground in close proximity to the position in order to obtain a clear field of fire ;
6. The construction of entrenchments and obstacles ;
7. The concealment of guns, troops and entrenchments ;
8. The construction of alternative gun emplacements in rear for use, if required, during the later stages of the action ;
9. The improvement of communications within the position ;
10. The watching of all portions of the position however steep or apparently inaccessible ;
11. The provision of effective cross-fire on all spaces in the line which are left unoccupied.

12. The provision of enfilading fire along the front of the position.
13. Suitable positions for supports and reserves.

When the force is sufficient and the circumstances favourable, provision must also be made for :—

14. The occupation of advanced positions or positions beyond the flanks which will deceive the enemy as to the extent of the position ;
15. The occupation of all positions from which an enfilading fire could be brought to bear ;

It must never be forgotten that the hour before daybreak is one particularly favourable for an attack, since the enemy is at that time able to approach the position under cover of darkness and attack with the first light of dawn. Consequently in addition to outposts and patrols, preparations should always be made against such an attempt, whenever there is the slightest possibility of attack.

To deal with these more in detail :—

1. *Reconnaissance.*

All ground within range of the position should be carefully reconnoitred, so as to find out any cover of which the enemy could avail himself and from which he could ascertain the means of approach to the position. At the same time, the range of all prominent points which the enemy is likely to pass over in the attack should be ascertained and marked in some conspicuous manner, for instance, by large stones. Range charts showing the ranges to all prominent objects should also be prepared and distributed to all officers in the firing line.

The Japanese marked the ranges to all prominent objects on small white pieces of wood, which were stuck in the ground at convenient intervals along the trench.

2. *Division of the Front into Sections.*

Should the front be very extended, or should it be running through close or broken country, it should be divided into separate sections for defensive purposes, each under its own commander. A commander must be readily able to control the whole of his section, and accordingly the extent of each section will vary with the nature of the ground.

3. *The Defence of Special Tactical Points.*

In order that there may be sole and undivided reponsibility, the defence of woods or other tactical points should be entrusted to complete units.

4. *The Protection of the Flanks.*

Unless the flanks are protected by natural obstacles or by mounted troops posted well on the flanks, they must be covered by strong local reserves, which should usually be echeloned in rear of the flanks.

For particulars of the duties of mounted troops on the flanks, see p. 226.

For particulars of the duties of local reserves, see pp. 237, 241.

5. *Clearings.*

As far as time and material admit, any cover—at all events within close range—which can be destroyed should be cut, pulled down, or blown up.

For further particulars as to clearings, see p. 725.

For particulars as to the time required for clearings, see table, p. 730.

In order to show up clearly men in khaki, a wide strip of grass may be burnt in front of the position.

6. *Entrenchments and Obstacles.*

It is laid down that every position should be strengthened as much as possible with a view to reducing the number of men required to hold it, and thereby increasing the strength of the general reserve.

Entrenchments should be dug for the use of the firing line and supports, and communications opened up between them. On many occasions in Manchuria communication trenches were even constructed to enable the reserves to reach the front, but this of course entailed an enormous amount of work, which is not consistent with the principle of temporarily holding a position with a view to the assumption of the offensive at the first favourable moment.

For particulars as to the siting and construction of trenches, see " Entrenchments," pp. 717–725.

As to digging trenches under fire, see p. 201.

If there is sufficient time for their construction, obstacles will add greatly to the power of defence. They must, however, be so constructed as not to interfere with any counter-attack.

For particulars as to the construction of obstacles, see p. 727.

7. *Concealment of Guns, Troops, and Entrenchments.*

All guns, troops, and entrenchments must be concealed as far as possible. Cover must also always be provided from which guns can sweep the hills or ridges which lie beyond the flanks but within range. It is laid down that if guns are placed in entrenchments, two or more emplacements should be prepared for each gun with a covered communication between them, so that if driven out of one, the gunners may use the other. In order to hide their gun pits from view the Japanese often hung branches on cords stretched between two uprights.

The firing line, supports, and reserve must each be concealed; the two former probably in trenches, and the reserve in folds of the ground. Care must also be taken that the position is not disclosed by men passing to and from the firing line. For this reason, when a position has been taken up during the night, the firing line should be in their position before daybreak if there is any probability of an early attack, or even of a reconnaissance by the enemy which would disclose the position of the trenches, were men seen to enter them.

For particulars as to concealment of entrenchments see p. 724.

8. *Construction of Alternative Gun Emplacements.*

It is advisable to prepare alternative emplacements for guns, including positions from which, during the later stages of the battle, direct fire can be employed. At the same time, communications between these emplacements should be prepared or improved.

9. *The Improvement of Communications.*

In order to provide for the rapid support of any threatened point, communications should be made, unless they already exist. This work will include cutting down portions of hedges, bridging streams, making holes in walls, and erecting sign-posts.

10. *The Watching of all Portions of the Position.*

It is never safe to leave any portion of the position unwatched, particularly when fighting in a hostile country, because, however steep and difficult they may appear, the enemy may know many ways of scaling places which, from above, may even appear inaccessible. It is often found that the steeper the hill, so much the easier is it for a few men to conceal themselves on it, for the reason that in many places overhanging ground may protect them entirely from view. If even a few men can once gain a foothold on the top, they may be most difficult to dislodge. Moreover, if a simultaneous attack from another direction is combined with this attack, the result may be disastrous.

The neglect of precautions of this kind brought about at least one regrettable incident in South Africa.

11. *Cross-fire on Spaces left Unoccupied.*

Weak places in a defensive line must of course be strongly held, but the whole of the line need not necessarily be occupied, provided any spaces can be swept by an effective cross-fire from other portions of the positions which are held.

The Japanese sometimes left 60 yards and more without a trench, but the ground in front was always covered by fire from the neighbouring trenches.

Salients, if they cannot be supported by effective infantry fire, and are exposed to artillery fire which cannot be answered, should usually, unless held to screen a position, be either left unoccupied and the ground swept in the same way by effective cross-fire or defended by strong entrenchments which can be supported from the main position.

12. *The Provision of Enfilading Fire along the Front of the Position.*

Arrangements should, when possible, be made for bringing an enfilading fire to bear on the enemy's firing line when he approaches close to the position, and is engaged in front. For this purpose machine-guns placed in carefully prepared and concealed positions may be of great assistance.

13. *Suitable Positions for Supports and Reserves.*

As to the most suitable positions for supports and reserves see p. 237.

If trenches on reverse slopes are used they should be situated at places where the slope is very steep, so as to be as free as possible from high-angle fire ; as to rifle fire, see Diagrams 7–9, pp. 316–318.

14. *Occupation of Advanced Post or Posts on the Flanks.*

In order to induce the enemy to make faulty dispositions, every endeavour should be made to deceive him as to the true position and extent of the front and flanks. Once committed to these dispositions, it may be difficult for him to alter them, even when he discovers his mistake. A plan often found to be effective is that of occupying posts in advance and on the flanks of the actual position, and particularly with mounted troops, owing to their greater mobility. In the case of a small force, such as a squadron or company, scouts should take the place of these larger bodies, and by constantly changing their position and opening rapid fire should endeavour to give an exaggerated idea of their strength. But, in order to provide for the safe retreat of the men occupying them, these points should either be covered by the fire of the defence or should have good lines of retreat.

In addition to holding advanced positions troops should be employed to screen the position, but these should be withdrawn as soon as it is seen that a serious attack is to be made, otherwise they will become too closely engaged, and will mask the fire from the main position.

15. *Occupation of Ground from which an Enfilading Fire can be delivered.*

Since an enfilading fire, or, worse still, a reverse fire, may render a position untenable, every endeavour should be made, if the force is of sufficient strength, to occupy and entrench any positions from which at least an effective artillery or rifle fire can be brought to bear on the main position. If the force is not of sufficient strength for this purpose, it may be best to take up some other position, but if this is not practicable, then arrangements should be made for covering with the heaviest fire possible, both artillery and rifle, any ground from which an enfilading fire could be brought to bear. By this means the enemy may be prevented from taking these positions, or, if he does take them, from occupying them for any length of time.

Relative Positions of Firing Line, Supports, and Reserves.

(*a*) *Firing Line.*

Generally speaking, the position of the firing line will be chosen with a view to obtaining :—

1. A clear field of fire and opportunities for oblique and enfilading fire along other portions of the front ;
2. Easy communication with the supports. If possible this should be under cover.

(*b*) *Supports.*

The position for the supports will be chosen with a view to obtaining :—

1. Ready means of access to the firing line, if possible under cover ;
2. Cover for the supports while waiting to reinforce ;
3. If other circumstances are favourable, somewhat higher ground from which the supports can with their fire support the firing line.

(*c*) *Reserves.*

The local reserves should be placed where they have facilities for local counter-attack while yet remaining under cover as much as they can. If on an exposed flank, they will usually be echeloned behind that flank.

The general reserve will usually be placed in rear of that portion of the position which appears to offer the most suitable line of advance for the counter-attack. But if the situation is so undeveloped as to make it uncertain in which direction the counter-attack should be made, the general reserve, it is stated, will for the time being usually be placed in rear of that flank against which the enemy is most likely to launch his decisive attack. The most favourable ground, it is stated, for counter-attack is that which lends itself most to the co-operation of all arms, and especially that which allows the advance of the counter-attack to be covered by artillery and infantry fire.

In a small force there will probably only be sufficient men to form one reserve. In that case the reserve must be so situated as best to guard an exposed flank, and yet be in a position to deliver the counter-attack. If both flanks are secure, the best situation is usually behind the centre. If, on the other hand, one flank is exposed, it is usually best to echelon the reserve behind that flank ; while if both flanks are exposed, it would probably be best to still retain the reserve in a central position until the attack has developed.

DISPOSITION OF A SMALL FORCE ON THE DEFENSIVE.

As regards the disposition of a small force on the defensive, men should be well extended, otherwise they will form a conspicuous target, and in addition to this they will cover a very small front without there being any counter-balancing advantage in the fact of their fire coming from one point. If a concentrated fire can be brought to bear on them when they are bunched together, it may be disastrous. If, on the other hand, the men are extended, the target which they offer is, to a great extent, as small and disseminated as that usually offered by an attacking force. If, in addition to extending the men, each man is placed behind any available cover, the enemy will obviously have far more difficulty in finding out the exact position or the actual extent of the flanks.

Unless resting on strong natural obstacles, the flanks should be the most guarded points of any position taken up by a small force.

Distance between Men.

In the case of a small force on the defensive, it is difficult to lay down any hard and fast rule as to the distance which men should be extended, since so much depends on circumstances; but they should at any rate not be so far from one another as to lose that feeling of mutual support which is of great value in a protracted defence. In citing six yards as a normal distance, in the case of a small force on the defensive, it must not be inferred that there may not be shorter or longer intervals, especially where there are any very weak or strong places in the line.

Duties of Flank Men of Firing Line.

The flank man of the firing line of any unit in action should not shoot, but confine himself to acting as the look-out man; first, to watch for the enemy trying to roll up the flanks; secondly, to see what the other units of his own force are doing;

and, thirdly, to look out for signals from the supports or elsewhere, as well as for any important moves.

C. HORSES DURING DEFENCE.

Disposition of Horses.

During a defence all horses must, of course, be kept out of sight as much as possible. In the defence of a hill, a hollow on the side least exposed to the enemy's fire should be utilised, if no sheep-pen, cattle kraal, or other shelter is available.

Escort to Led Horses.

Unless the led horses are placed in some position where they are practically safe from attack, an escort should always be told off to protect them. The strength of the escort must depend on the nature of the ground, and whether the enemy has mounted troops at hand who could quickly attack the led horses.

The main object of such escort is to guard the horses against capture or stampede. And for this purpose a suitable position for defence should be chosen under cover as much as possible and usually on the most exposed flank of the horses. An officer or non-commissioned officer in command of this escort should keep an eye both on the dismounted men and the enemy. In addition he should send out—particularly in an enclosed country—a scout or scouts to give warning of any attempt to attack the led horses.

The escort will be available either to follow up any success or as far as possible to cover the retreat, in the event of the dismounted men having to retire under very disadvantageous circumstances.

Unless the horses and escort are under cover from fire they should not be kept directly behind the dismounted men, or else they may be struck by some of the bullets fired at the latter.

V. Signalling and Transmission of Orders.

Importance of Organisation.

The importance of a thorough system of transmission of reports and orders can hardly be exaggerated, particularly in the case of a large force where, unless the ground is very suitable, it is quite impossible for a commander to observe himself the various fleeting opportunities for an effective counter-attack which may occur during the course of the action. These opportunities, unless they are immediately seized, are often lost altogether.

Organisation.

The organisation of a system for the transmission of messages by signalling is not within the scope of this work. Full particulars are given in the Signalling Manual. For transmission of messages by other means, see p. 137. For skirmishing signals, see p. 192.

VI. Defence against Actual Attack.

Fire Tactics.

For principles of Fire Tactics, see pp. 294–319.

Duties of the Firing Line.

The duty of the firing line on the position itself—as distinguished from an advanced position which is only occupied temporarily—is of course first and foremost to maintain its position despite the heaviest rifle or artillery fire, to co-operate with the artillery in crushing with fire the attack as it develops, and to attain a superiority of fire so that not only can local counter-attacks be made, but an opportunity created for the delivery of the decisive counter-attack. When counter-attacks are made, the firing line should with its fire cover the counter-attack as far as possible, and should never leave its position or trenches. If casualties occur, or it becomes exhausted, it must be replenished from the supports.

In the initial stages of the action the enemy's artillery will endeavour, after finding the approximate range, to cover the site of the trenches with a sweeping or searching fire preparatory to the advance of his own infantry. Until fire is opened, the more shelter the firing line can obtain in its trenches the better, provided of course that a sharp look-out on the immediate front is kept by one man at least in every section of trench. As to opening fire, see p. 301.

Duties of Supports.

The duties of supports are:—

1. To reinforce the firing line;
2. If on higher ground, to support, whenever possible, the firing line by their fire.

Unless there is good natural cover, the supports should be entrenched. If the ground is very open and the means of communication between any possible position of the supports and the firing line very exposed or a surprise attack likely, the supports may be placed in the trenches with the firing line.

Duties of the Reserves.

(*a*) *Local Reserves.*

The duties of the local reserves are:—

1. To carry out any local counter-attack;
2. If situated behind a flank, to protect that flank.

(*b*) *General Reserve.*

The duty of the general reserve is to carry out the decisive counter-attack, and it will be kept in hand until the moment for that arrives.

Ruses.

See p. 186.

Defence against Cavalry.

(*a*) *While Mounted.*

When mounted troops are operating in close proximity to the enemy's cavalry, a very sharp look-out must be kept for any sign of his advancing to the attack. A minute or two more time in which to prepare to meet a charge may mean just the difference between defeat and victory.

Cavalry when of considerably superior strength to the attacking cavalry may deliver a simultaneous attack on both his front and flanks, supported possibly by the fire of dismounted men, but when of equal or somewhat less strength they will usually, unless the enemy remains for a considerable time in a faulty disposition, make but one attack and that if possible against his flank, because that will compel him to employ his own forces, not in a single effort, but in a succession of efforts.

Should the numbers or position of the defending cavalry force be considerably inferior to that of the attackers, it will probably be best to dismount all the men, with the exception of a small escort to the led horses, so that the attack may be met with a heavy rifle fire.

A force not armed with *l'arme blanche* should meet a cavalry attack by immediately dismounting, say, three troops out of each squadron ; each troop quickly taking up a formation for defence. The remaining troops should act as escort to the led horses, which should be placed in the immediate rear well under the protection of the dismounted men.

(*b*) *While Dismounted.*

Each group of dismounted men should immediately take up a formation for defence, so that no body may be broken, even though the cavalry break through between the bodies. On open ground, the men forming each body should keep within at most two or three yards of each other.

The group leaders must see that the heaviest fire possible is poured on any charging cavalry, each man firing at his best rate. Aim should be taken at the horses in preference to the men, because riderless horses, by galloping alongside the ridden ones, may help by sheer force of weight to break up the groups; whereas dismounted or fallen men are not likely to do much harm.

VII. Counter-Attack.

Two Kinds of Counter-Attack.

Counter-attacks are of two kinds, *i.e.* local and decisive.

Local counter-attacks are delivered by the local reserves with a view to compelling the enemy to use up his own reserves or to retaking ground which has been taken from the defenders.

Decisive counter-attacks are delivered by the general reserve with a view to gaining the initiative, driving the enemy back, and, if possible, routing him.

General Principles.

Except where the commander intends to fight a delaying action, a defensive attitude by the whole force must be merely a precursor, though possibly after a prolonged fire fight, of a decisive counter-attack.

Though opportunity may arise for cutting the enemy's centre, it is laid down that the decisive counter-attack will usually be more effective if delivered against one of the flanks and in such a direction as to threaten his line of retreat. Surprise should always be aimed at in a decisive counter-attack.

Decisive Counter-Attack.

Preparations for Decisive Counter-Attack.

(a) By a Large Force.

The general reserve will assemble in a position which is covered from the enemy's fire and also from view. The choice of position has already been dealt with on p. 230.

The commander of the reserve should be in continual touch with the commander of the cavalry so that he may hear from him of any favourable opportunity which arises. He should also be in close touch with the commander of the whole force.

The commander of the reserve should personally reconnoitre the ground over which he is to operate, so that he may be ready to issue his orders immediately the order to counter-attack is given by the commander of the whole force. When he is ready to issue his orders, the commander should tell all his subordinate commanders the probable direction of the counter-attack and explain to them how he proposes to carry it out. They in their turn must explain this to the officers under them, and impress on them the necessity of coming to close quarters as quickly as possible and pressing the attack home with the utmost vigour. The last reserve must, if necessary, be thrown into the attack.

Since the most favourable opportunity for attack may quickly pass, staff officers and patrols must keep a close watch on the progress of the engagement, and the general reserve should be drawn up in a formation in which they can at once advance and readily come into action. They should remain in constant readiness to move immediately the order is given.

(*b*) *By a Small Force.*

Even in a very small force a reserve should always be kept in hand in order to carry out the decisive counter-attack.

When a small force is preparing for a general counter-attack some troops may be echeloned towards the enemy's flanks. If they can remain concealed in this position they will probably be able to enfilade the enemy for some time before their position is actually located.

A counter-attack should, of course, come on the enemy as a surprise. Therefore, in massing the men preparatory to a counter-attack, the men should be kept well under cover.

Time for Delivery of a Decisive Counter-Attack.

(*a*) *With a Large Force.*

In the case of a large force, opportunities for a decisive counter-attack offer themselves at a time when the enemy has:—

1. Exposed his flanks;
2. Left some portion of his force without hope of support;
3. Extended his front to too great an extent so that the larger portion of his force is in the firing line
4. Placed his reserves in a wrong position; or
5. Used up his reserves in unsuccessful attempts to carry the position.

(*b*) *With a Small Force.*

The right moment for delivering this counter-attack, when the attacking force is small, is either:—

1. When the attacking force has been surprised by fire being suddenly opened on it, and is either beaten back in confusion or brought to a standstill; or
2. When the attack, though advanced almost to close quarters, lacks the necessary impetus to carry it through; or
3. When the attacking force is falling back after an unsuccessful assault.

Method of Delivering Decisive Counter-Attacks.

The cavalry who are allotted to the general reserve should usually cover the flanks of the counter-attack. In the case especially of a small force where the enemy's flanks and line of retreat may be readily accessible to these troops, some of them may aim at getting behind a flank in order to seize a position close to his line of retreat.

As regards the infantry, the formation and disposition of the force is, generally speaking, similar to that of a decisive attack (see pp. 187 and 203).

The main steps towards a successful counter-attack is the attainment of a superiority of fire immediately before its delivery. To that end the fire of every available gun and rifle should be concentrated on the point against which the attack is to be launched.

The actual counter-attack must be delivered with the utmost vigour on all occasions, because not only is the enemy to be beaten back, but he must, if possible, be routed and driven from the field.

The troops who are not detailed for the counter-attack must, as far as possible, cover with their fire the advance of the counter-attack and, immediately any decisive success has been gained, press the enemy at every point and with the utmost determination.

Local Counter-Attack.

Occasions for delivering it.

The following are the principal occasions on which local counter-attacks are made:—

(1) When the enemy gains a local success on the position itself;

(2) When a superiority of fire, even if only temporary, has been gained over any portion of the attacking force;

(3) When the enemy's firing line comes within reach without sufficient support.

In the first case, the necessity for counter-attack becomes imperative and the sooner it is delivered the better, so that the enemy may have no time to strengthen any ground he may have won. At Liao-yang, for instance, attacks and counter-attacks on one position alone lasted two or three days, for the reason that no sooner was the position taken by one army than it was attacked by the other.

In the second and third cases, the opportunity should be seized since by this means the enemy will be compelled to use up his reserves to restore the tide of battle, and so weaken himself for the moment when he will be struck by the large number launched against him in a decisive counter-attack.

Much may be done to tempt an enemy to expose himself to counter-attack, such, for instance, as the hasty retirement of an advanced post, a slackening of the fire—as though through an abandonment of the trenches—or even the actual withdrawal of a small portion of the line.

Method of delivering Local Counter-Attack.

When the enemy has gained some local success, a flank attack, if the ground is suitable, combined perhaps with a frontal one may be made to compel him to evacuate it. Failing a success by day, an attack may be made by night.

A counter-attack, when once it is launched, should not be pushed too far. The attack should be carried out in the same way as an ordinary attack, but the firing line should usually be brought up to its maximum density of 1 man per yard at an early stage. The original firing line on the position should not leave the trenches. To compel the enemy to expend a greater effort in repulsing it than is required for its delivery is one of the main objects of the attack.

VIII. Retreat.

See page 180.

Defence of Particular Localities or of Convoys.

Defence of Bridge or Ford.

In the defence of bridges, fords, or other similar places, the most suitable position from which fire can be concentrated on the place to be defended must determine the exact position of the defenders. The men should be posted, if possible, fan-like round the point on which fire is to be concentrated.

Before the attack begins, wire, or any other obstacle which does not afford cover to the enemy, should, if time permits, be placed across the passage. The purpose of putting down such obstacles is to delay the enemy in the very place where fire could be made most telling. (*For details of obstacles, see pp. 727–736.*)

If in the event of failure to hold a bridge, the orders are that it is to be destroyed, preparation must of course be made beforehand and men told off especially to fire the charge at a given signal. (*For details of destroying bridges, see pp.* 685–699.)

As the most obvious course in many cases for the enemy to take, where he found the passage strongly guarded, would be to cross either above or below this point, the river should be patrolled or the reaches watched for some distance on either side.

Defence of Convoy.

Since the defence of a convoy is at all times difficult, every care should be taken to avoid attracting the enemy's attention. For instance, non-commissioned officers, patrols and scouts, when searching the surrounding country with their glasses for any possible danger, should be careful not to show themselves on the sky line. Should the convoy be passing up, say, a valley two or three miles broad, the flank guard and patrols should be kept on the convoy side of the ridges on either side of the valley, while the non-commissioned officer and any men detailed for the purpose dismount continually to view the country beyond.

Small advanced and rearguards should be detailed, and the main portion of the escort should move in a convenient formation on the flank of the convoy from which an attack is expected. At the same time sufficient men should march alongside the convoy so as to preserve order and maintain communication.

If an engagement is inevitable, it devolves on the commander to see that it takes place as far from the convoy as possible. If attacked, a convoy should not be halted and parked except as a last resource.

If the convoy has to go through any pass, where it would be at a particular disadvantage, the escort should occupy the bordering ridges both before and during the passage of the convoy. All men accompanying a convoy should be fully armed, and know what to do in case of attack.

If attack is threatened on a mechanical transport convoy each of the mechanical vehicles should in the first instance be drawn up at right angles to the line of advance so as to enable the column to advance or retire as circumstances demand.

Defence of Woods.

Defending a Portion of a Wood.

In a large wood, when there are not sufficient men to hold the entire front edge of it, a position should be selected behind the wood from which a fire can be brought to bear on the enemy as he issues from it. But if a portion of the wood can be found divided from the rest by a broad ride or other open ground, this portion may be defended just as if it were a whole wood.

Defending the Whole of a Wood.

In defending the whole of a wood every possible means should be taken to prevent the enemy gaining an entrance, because when once he has gained a footing in even a corner of it, he may secure the same advantage of cover as the defender and anyhow be on more equal terms with him.

If likely to be exposed to artillery fire, the firing line should advance in front of the wood, finding such cover as they can, or if time does not press, they should entrench themselves. The reason for this is that the artillery can thoroughly search a wood with high explosive shell and make it practically untenable. If, on the other hand, the line is likely only to be exposed to rifle fire, the front edge of the wood is the better position to hold, as good cover is more readily obtainable. In this case led horses can, in the meantime, be kept under cover in the wood, and, if the wood offers good shelter, every alternate No. 3, handing his horses over to the horseholder of the next four horses, can take his place in the firing line.

Defence if Entrance Gained.

If, however, the enemy has gained an entrance to the wood, great activity in counter-attack must be displayed in hustling him from place to place in an attempt to make him vacate it.

If there should have been time beforehand to clear and entrench a position in the interior of the wood, it will at this point be of great assistance.

Provision for Retreat.

If, in addition, there has been time to make a second defensive position behind the wood on the probable line of retreat, so much the better. If compelled to withdraw, the defenders would then possess a position to fall back upon from which a steady fire might be maintained to prevent the pursuers issuing from the wood.

Co-operation of Mounted Troops with Infantry.

In order that ample warning of any turning movement may be given, mounted troops, if employed with infantry in the defence of woods, may be used on the flanks, watching every track throughout the wood. After ascertaining the exact line for which he is responsible, an officer or non-commissioned officer in command of a body detailed for this purpose should personally post his men in positions where, from rising ground or clearings, they can get the best and widest view possible. He should at the same time see that he is in touch with the bodies on either flank, besides naming some rallying point on which the men should form, in case they should be driven in. If the wood is very dense, each man should blaze a tree on either side of him, so that the exact direction of the men on either flank may not be lost.

Duties of an Escort to Artillery.

On Line of March.

If the roads are dusty the men should be kept, if possible, off the road, because marching on the roads only adds to the dust caused by the passage of the guns, and much dust may attract the enemy's attention at a great distance.

Position of Escort in Action.

Artillery will, as a rule, be protected while in action by other troops, but if guns are in an exposed position, an escort must be detailed, and if none has been detailed, an artillery commander must apply to the nearest troops for an escort, mounted if for field artillery, infantry if for heavy or mountain artillery.

It is laid down that the senior officer present will issue the necessary orders to the escort, but the commander of the escort will be given a free hand in carrying out those orders.

All ground in front and on the flanks of the guns, which would enable the enemy to approach unseen and open fire on the guns within 1000 yards, must be occupied, or at any rate covered, by the fire of the escort or other troops. Ground even somewhat beyond that distance, from which an oblique fire could be brought to bear on the guns, should be at least covered, by the fire of the escort or other troops. In addition to this scouts should be pushed well out, so as to give warning of the enemy's approach. Unless there is some dip in the ground, the escort should not be directly in front of the guns if the guns are either less than 500 yards distance, or the escort is within 500 yards of the target.

The led horses should not be kept directly in rear of the guns, since in that position they would receive some of the fire meant for the guns.

Infantry Attack on Guns.

In the case of a cavalry escort, should infantry advance to attack the guns, some men from the firing line may be withdrawn, in order to mount and charge, if the enemy are shaken by the fire; but so that the attention of the infantry may be occupied, the dismounted men should continue firing up till the moment of impact.

Cavalry Attack on Guns.

Owing to the rapidity of cavalry attack, should the attacking force be one of cavalry, it will probably not be possible to place men in the firing line, and then withdraw them in time to charge. Consequently, if cavalry form the escort, a large portion of the men should stand by their horses, ready at any moment to mount and charge in the event of the attacking cavalry being shaken by the fire.

If, however, the number of attacking cavalry be so large as to render a charge by a portion of the escort of little use, it will be better to place all the available men in the firing line, unless, of course, the attack is so made that the guns can assist in their own defence by a heavy fire at close quarters.

It must be borne in mind that it is often difficult for gunners when in line to bring fire to bear on an attacking force who may unexpectedly take the guns in flank.

Simultaneous Attack by Cavalry in Front and Flank.

If not resting on naturally strong ground, the exposed flank or flanks of the escort should be strongly held, if they have not been artificially strengthened. An attack by cavalry may be made on the guns simultaneously in front and flank, first by a line in extended order, and then by squadrons in close order. The chief object of the extended line is to mask the fire of the guns and escort. Hence, should this line break before or on reaching the guns, or even get right through, the squadrons which follow in its wake must be met with the very heaviest fire possible, and the greatest determination not to yield ground. To yield ground at such a moment is fatal.

THE ENCOUNTER BATTLE.

Conditions under which an Encounter Battle is fought.

An encounter battle is brought about by the unexpected meeting of two forces. Under these circumstances the conditions—at all events at the beginning of the battle—are different to those where one force attacks another in position, since in an unexpected encounter a commander is at first usually ill-informed of the strength and disposition of the force with which he is suddenly confronted, and there is no time for the deliberate reconnaissance and preparation which precedes an attack on an enemy in position.

Action of Cavalry and Protective Troops.

On encountering the enemy in strength, the cavalry will at once do what is possible to supply the demand for information, while the protective troops, unless there are definite orders to the contrary, will usually push back the enemy's advanced troops in order to gain ground for the deployment of the main body and will also hamper the deployment of the enemy. These steps can generally be taken without definitely committing the commander to attack in force.

Considerations which will guide a Commander as to whether to attack.

Though the general strategical situation must, it is stated, be the deciding factor with a commander when coming to a decision whether or not to attack, the following considerations should be borne in mind :—

(1) Once two forces are in close contact it is usually difficult to avoid an engagement.

(2) The enemy is probably in an equal state of uncertainty as to whether or not to attack.

(3) The advantages of the initiative and the offensive should only be abandoned for weighty reasons.

Early Deployment.

If a commander decides to attack, it is essential to deploy before the enemy can do so.

There will probably be no time for the issue of formal orders, and consequently verbal orders may have to be issued to each portion of the force as it deploys from column of route.

Intercommunication and Co-operation.

It is very important that each unit, when deployed, should keep the units on either flank fully informed both of its own progress and of the course of the action.

In an action which begins with so little warning the first intimation which flank guards or other detached forces may have of the action is the sound of guns. In that event they should at once take steps to ascertain the position and to co-operate in the way which appears best.

Fire Tactics.

For principles of Fire Tactics see pp. 294–319.

Continuation of the Attack.

If the commander has gained the initiative, and engaged the enemy all along the line, the attack will proceed on the same lines as an attack on an enemy in position (see p. 198).

If, on the other hand, the enemy deploys first, or it appears clear that he will probably do so, the commander should, with his advanced troops, delay the enemy and thus prevent the main body becoming seriously engaged until the deployment of the troops is well advanced. If this is not done, the force may either be enveloped as they deploy or defeated in detail as they come into line.

THE DELAYING ACTION.

Occasions for fighting a Delaying Action.

The occasions for fighting a delaying action are :—

(1) To await the arrival of some other force ;

(2) To cover a concentration in rear ; or

(3) To gain time for decisive action elsewhere.

1. *To await Arrival of some other Force.*

If the commander intends to await the arrival of some other force which can come up during the course of the action, the force which is already on the field will take up a defensive position as already explained on p. 236. But with this difference, that the whole or nearly the whole of the force will occupy the position either as the firing line, supports, or local reserves, leaving the other force, when it comes up, to act as the general reserve, and when the action has sufficiently developed, to strike the decisive blow.

2. *To act as a Covering Force or to gain Time.*

When a force already on the field has either to cover a concentration in rear or to gain time, the two principal considerations are: the strategical situation and the nature of the country. The former will probably limit very closely the area within which a commander must make a stand, while the latter will prescribe to a great extent the tactics he must adopt.

If a position cannot be turned or only turned by a very wide movement occupying a long time, the delaying power of a small force is very great, and where there are a succession of such positions the force may, if they follow the tactics of a rear guard (see p. 32), and take up one position after another, exhaust a very much larger force. If the force has liberty to manœuvre and the enemy is advancing through a difficult country, his advanced troops may be attacked whenever they emerge, and pushed back on to their main body, thus making the deployment of the latter very difficult.

If, however, the country offers no particular advantages to the delaying force, there will probably be no alternative for them but to engage the enemy; compelling him to deploy as often as possible, but rarely accepting battle and where compelled to do so, withdrawing either under cover of darkness or after delivering a counter-attack.

Fire Tactics.

For principles of Fire Tactics, see pp. 294–319.

PART V.

NIGHT OPERATIONS.

GENERAL CONSIDERATIONS.

The advantages to be gained by offensive operations at night are obvious, but the difficulties entailed are unfortunately obvious, too. Not only is there the difficulty of maintaining the direction and accurately timing the various movements as well as maintaining connection between the various units, but the abnormal state of the men's nerves, and the increased difficulty of controlling the men at night time are serious factors. At the same time there is no doubt that most of these difficulties can be overcome, or at any rate greatly diminished, by forethought and experience. Hence constant night work practised in combination by the three arms cannot be too strongly urged.

It is, however, laid down that when the conditions of fire fight are likely to be favourable, it will probably be better to accept the inevitable casualties that must result from a struggle for fire supremacy in preference to the undoubted hazards of a night attack.

Night operations may be roughly divided into :—

A. Night Marches.
B. Night Advances.
C. Night Attacks.
D. Night Defence.

A. NIGHT MARCH.

Object of Night March.

A night march is usually undertaken to outflank an enemy, to anticipate him at some important point, to concentrate superior strength secretly at some place, or to avoid an engagement, but it is laid down that a night attack will rarely be the sequel of a long night march. When a night march is made prior to an attack its immediate objective is the position of assembly.

Reconnaissance.

A thorough reconnaissance should rarely be omitted.

The route should be examined both by day and by night. The general compass bearing, the turnings in the road which are to be blocked in order to prevent the column taking a wrong turning, as well as all points where checks are likely to occur should be carefully noted. Besides this a sketch of the route to be followed should also be prepared in the manner described on p. 268. A copy of this report as well as of the sketch should be given to the commander of the advanced guard.

The most suitable method of protection during the march should also be mentioned.

For heads of Reconnaissance Report for Night March, see p. 105.

Preparations for a Night March.

It is almost needless to remark that all preparations should be made quietly.

It is laid down that outposts should not be withdrawn, but should be left in position till daylight to follow the column when convenient Bivouac fires should be left burning, and arrangements should be made for keeping them alight.

Steps should be taken to prevent accoutrements and wheels of vehicles from rattling, while all horses should be kept well in rear, those likely to neigh being left with the second line transport. Though bogus orders may, in order to deceive spies, be issued in the afternoon as though for the next day, the real orders should be issued as late as possible, when all ranks should be informed what they are to do in case of attack.

It is laid down that surprise in some form is usually an essential in night operations. Secrecy of preparation is therefore important, but this should not be allowed to interfere with the thoroughness and care with which preliminary arrangements are made, and upon which the success of a night march is chiefly dependent. For instance, assuming that the march is to result in an attack at night, not only must time be calculated for the march, the assault, and capture of position, but time must be allowed for fortification of the latter before daylight. If, on the other hand, an attack at dawn is contemplated, the march must be so timed that the troops will reach a point within striking distance, just at the time when there is light enough to begin operations. Hence the time of starting, the rate of march, and the distribution of the troops—all details of vital importance—must obviously be calculated most carefully if the attack is to have a favourable chance of success.

Should the march begin in the dark, the starting point will usually be marked by signalling lamps or fires, the methods of marking being mentioned in the operation orders.

Maintaining Direction.

In addition to the various mechanical means which may be employed for maintaining direction, the employment of a local or native guide, where possible, is always advisable, provided that the necessary precautions are taken to prevent any communications between him and the inhabitants.

An officer should invariably check the distance marched.

Marching on Bearings.

On a Clear Night.

The bearings having been once found, one can on a clear night pick out a star or natural feature which is in the required direction, and march on that.

The best method of picking out a star or point on which to march when the compass is set is to lay a pencil across the centre and that point of the compass on which it is desired to march, and then notice the star or feature to which it points.

It is almost needless to say that the observer must be careful while doing this to keep the compass set.

When marching on stars, the following rules should be adopted :—

A low star, not more than 25° above the horizon, should always be employed. The *maximum* change of bearing of such a star is about 15° per hour, but it is generally less. In high latitudes, stars E. or W. change their bearing more slowly than stars N. or S.; in low latitudes, all stars change their bearings slowly.

It is impossible to make a simple rule to cover all cases, but generally speaking, in high altitudes, say 50°, a star will usually not change its bearing more than 1° in 5 minutes ; in medium latitudes, say 30°, more than 1° in 9 minutes ; while near the Equator, it will not change more than 1° in 15 minutes.

One can thus calculate, in any latitude, how long it is safe to march on a star before taking another observation. An error of 1° in bearing produces an error per mile of about 30 yards right or left.

SERVICE PRISMATIC COMPASS.

A prismatic compass is an instrument used for observing bearings with reference to the Magnetic North.

The Service Prismatic Compass consists (*vide* Plate 8) of a magnetic needle, balanced on a pivot and carrying a card (A), divided into degrees, contained in a metal box fitted with a revolving ring. The metal cover (B) opens on a hinge, and is fitted with a glazed window (C), on which is a fine black line (D), for use as a sighting vane. Opposite the hinge of the cover is fitted a prism (E), through which can be read the graduated edge of the card, while at the same time an alignment of the object whose bearing is being taken, and the black line (D) on the cover are observed through the slit (F) above the prism. The prism should be moved up and down slightly until the figures on the card can be clearly seen. A " clamping-screw " (G) is provided for clamping the needle when not in

PLATE 8.

PRISMATIC COMPASS

A. Card. B. Cover. C Glazed Window.

D. Fine line used as a sighting vane

E. Prism. F. Slit above prism

G. Clamping screw.

H Brass ring.

Night Work.

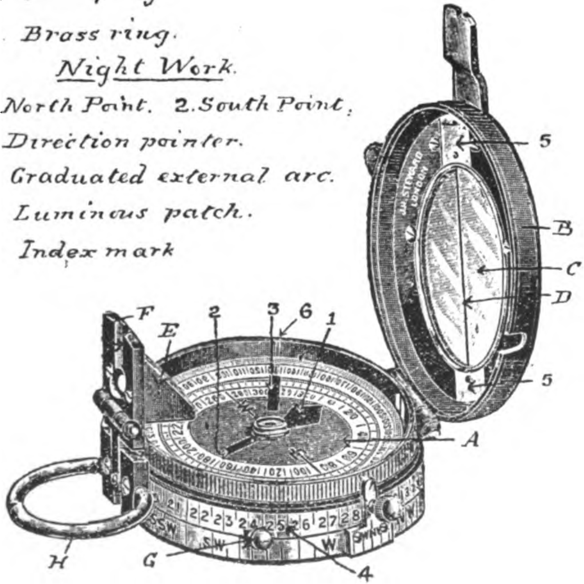
1. North Point. 2. South Point.

3. Direction pointer.

4. Graduated external arc.

5 Luminous patch.

6 Index mark



use, and a " check-spring " for checking its oscillations when observing. A brass ring (H) is attached for convenience in holding the compass.

Method of using the Prismatic Compass by Day.

To use the compass, first turn up the cover (B), and see that it is upright, and unclamp the screw (G). Then turn up the prism (E), raising or lowering it until the divisions on the card can be clearly seen. Then stand facing the object, and, holding the compass by the ring (H) in front of the body, watch the swing of the card. By pressing the " check-spring," which touches the edge of the card, check the card when nearly midway in its swing. When quite steady, raise it slowly to the eye, holding it horizontally with both hands, so that the card may not touch the cover. Then observe the object through the slit (F) over the prism, and when the black line (D) is aligned upon it, read the division on the card which is cut by the black line. This will be the bearing of the object.

The card must not be checked whilst the observation is being made, and the compass must be held quite level. Practice and a certain amount of " knack " which is easily acquired, are necessary to take bearings quickly and accurately. In windy weather it may be necessary to kneel, resting the elbow on the knee, or resting the compass on any convenient place, such as the top of a low wall. Care must be taken not to use the compass near a mass of iron, such as a gate, lamp-post, etc. If an observation must be taken close to a railway, perhaps the best place to stand is in the centre of the 6-foot way, where there is an equal quantity of iron on both sides.

Method of Using the Prismatic Compass by Night.

One of the best instruments to use for this purpose is the Service Prismatic Compass, a drawing of which is given on Plate 8. The card (A) of this compass is luminous for night work, and is marked with 16 points, the north having a large diamond-shaped figure (1), and the south a small circular one (2). A revolving glass ring is fitted over the compass card, and on the glass there is a black direction pointer (3), radiating from the centre, in prolongation of which is a small brass "setting vane" (6), this working over an external arc graduated in 360° (4). On the inside cover (B) are two luminous patches (5), which give a good alignment of the instrument at night when it is held in the hand with the cover wide open. The compass is so constructed that if the movable "setting vane" (6) is turned to point to the bearing on which it is desired to march, as shown on the external arc (4), and the North Point (1) is made to correspond with the black direction pointer (3), then *the luminous patches* (5) *in the lid indicate the line of advance.*

When a compass is not Available.

When a watch, but no compass is available and the sun is visible, then, if not in the tropics, the north and south line may be *very roughly* ascertained in the daytime in the following manner. But, in accuracy, this method is not to be compared with the method of ascertaining the direction by means of the compass. Hold the watch face upwards, point the hour hand at the sun, if in the northern hemisphere, and lay a pencil across the centre of the watch, so that it exactly bisects the angle between the hour hand and XII. The line of the pencil will give the N. and S. line, the end of the pencil farthest from the bisected angle pointing towards the north. If in the southern hemisphere point XII. at the sun and lay a pencil across the centre of the watch, so that it exactly bisects the angle between the hour hand and XII. The line of the pencil gives the N. and S. line, the end of the pencil nearest the bisected angle pointing towards the north.

On a Cloudy Night.

If no observation has been obtained before the sun has set, and, owing to clouds, neither moon nor stars can be seen, the only method by which to ascertain the bearings is by a magnetic compass.

Before making use of a compass its variation must always be ascertained, because all compasses, besides having a normal magnetic variation, have a variation of their own. The simplest way of ascertaining the variation of a particular compass is to find on the map a well marked and accessible point, then to carry the compass there, and after looking out for a landmark as distant as possible, to take the magnetic bearing to it. The difference between that and the true bearing, as ascertained by the map, represents the total variation of that particular compass.

In order to find a bearing at night and to march on it, the Service Prismatic Compass (described on pp. 259, 260), or any other similar compass which is prepared with luminous paint, may be used. The paint should be exposed to daylight from time to time, and especially for two or three days before the compass is required for night use. It should be intensified by burning magnesium wire over it just before starting on a night march. Since the light is very strong, this must be done in a secluded spot if secrecy is essential.

To act as a pointer to show the direction during a night march, and also to save continual reference to the compass, a stick should be made white either by covering it with white paper, or better still by painting it white, with luminous paint.

To use this stick, take the compass, properly set as explained on p. 261, and stand perfectly still until it comes to rest; hold the stick, pointing it slightly upwards and in the direction indicated by the luminous patches (No. 5, on Plate 8) on the compass lid; then, if it is not too dark, pick out some object, on the skyline if possible, to which it points, and march on that. When this object has been reached, repeat the process, then move forward to the next object, and so on.

A very much better arrangement, however, is that suggested by Colonel E. S. Heard, and shown on Fig. 1, Plate 9 (p. 265). A bracket is fixed on the lower end of the stick and the compass placed on it with the cover laid back along the stick. This gives a steadier rest for the compass and at the same time a more accurate idea of the direction of the line of march on the given bearing. This bracket may be used either with a Service Prismatic Compass or with a Transparent Compass, *i.e.*, one with a glass top and bottom with the needle pivoted between them. If a service prismatic compass is used, it should be set in the manner already referred to; but if a transparent compass is used, a disk, the size of the bracket, should be cut out of a piece of luminous cardboard and graduated counter-clockwise as shown in Plate 9, Fig. 2 (p. 266). The disk should be kept in place on the bracket by a rubber band stretched across the required bearing, *e.g.*, 45°, as shown in that Plate, the compass being then laid on the top. When the needle is over the band the stick is pointing in the right direction.

If it is too dark to pick out any object, the guide must either turn himself so as to be facing in exactly the right direction; he can then, without going much astray, march at least fifty yards, and then set himself again, and so on—or he must make use of an assistant with a luminous patch on his back. The assistant should note carefully the alignment of the stick and advance for fifty paces or less in what he considers the right direction and then halt without any signal. The guide can then correct the alignment himself if necessary and halt to the right or left of the assistant, if the guide thinks that the assistant has not moved in the true direction.

The guide should keep at least 50 yards ahead of the troops so that the compass shall not be affected by the rifles, and he should have an assistant with him to keep an account of the distance marched. The assistant should carry a sheet of paper and tear a nick in it at the end of each hundred yards.

Instead of the stick, a transparent compass can be used with

PLATE 9.

NIGHT MARCHING STICK.

FIG. 1.

A • Night marching stick with compass bracket E.

D • Luminous cardboard strip, fastened on stick.

B • Compass on bracket, side view.

C • Compass on bracket, front view.

F • Luminous patches on inside of cover of compass box.

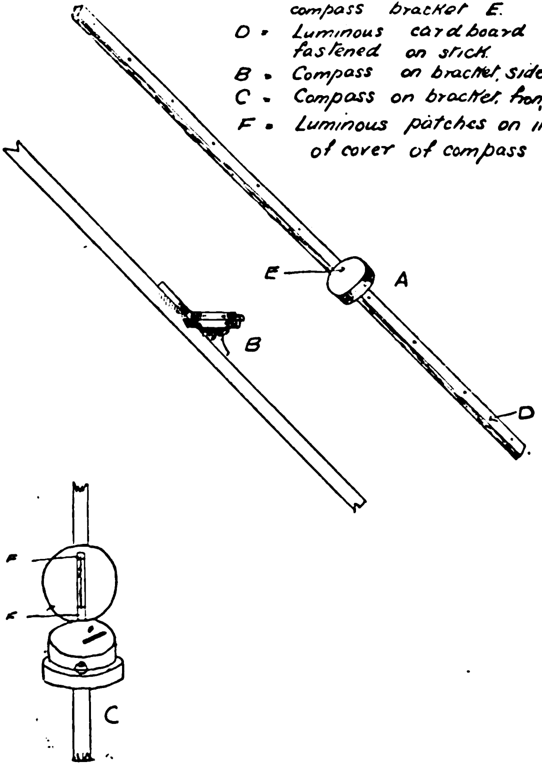


PLATE 9.

LUMINOUS DISK FOR TRANSPARENT COMPASS.

FIG. 2.

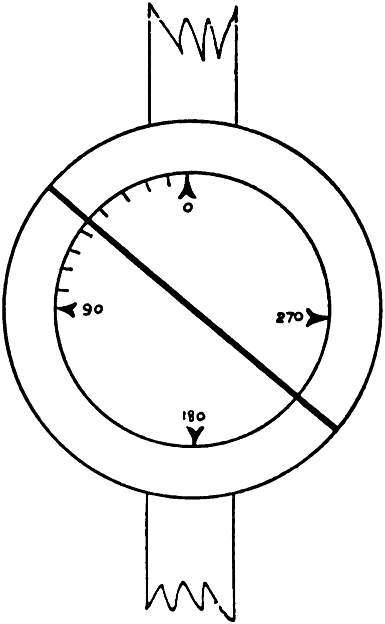
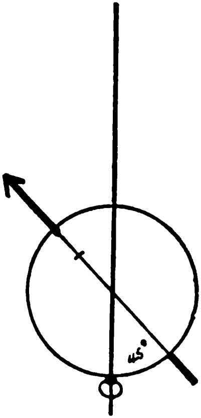


FIG. 3.



a piece of luminous cardboard about 8 in. long and 3 in. or 4 in. broad. In this case, draw a line in pencil down the centre of the card to represent the direction of the line of march. On the lower half of the card draw another line across the first to represent the magnetic meridian. This second line must be drawn at the same angle to the first as the direction of the march bears to the magnetic meridian. At the northern end of this line draw a thick arrow head. Fig. 3 on Plate 9 (p. 266) shows the card prepared for a march on a magnetic bearing of 45 degrees. Ink these two lines in about one-eighth of an inch thick. For use at night, place the compass on the cardboard so that its centre, the pivot of the needle, comes exactly over the intersection of the two lines. The centre line on the card shows the required direction in which to march. The compass may be kept in its place on the cardboard by an indiarubber band.

Care should be taken when getting a transparent compass to see that the needle is broad enough to be seen easily at night against the luminous paint, and that its North end is marked by an arrow head, so that it can be easily recognised.

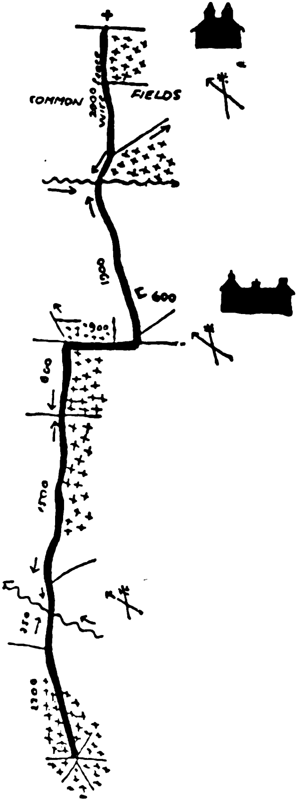
SKETCH FOR NIGHT MARCH.

The route to be followed on a night march should be sketched in the ordinary way, and the points mentioned on page 257 carefully noted.

If an ordinary sketch is used during the night march, light must be provided from time to time, either by an electric torch or matches, so that the map can be consulted. This is an obvious disadvantage, as there is always the chance of the light being seen by the enemy.

To get over this difficulty, Colonel E. S. Heard has suggested an excellent form of sketch and a method of using it which obviates any risks, besides facilitating the work of the officer guiding the column.

PLATE 10.


COMMON
2000
WIRE FENCE
FIELDS
1900
600
900
800
1500
250
1200

The only requirements are tracing cloth or paper and a piece of luminous cardboard.

The route is traced from the ordinary sketch on to tracing cloth or paper, and finished off as shown in Plate 10. The sketch is then wound on to a Cavalry sketching board, and a piece of luminous cardboard cut to the size of the board is slipped between it and the board. When placing the tracing cloth on the rollers of the board, the inked side should be placed underneath. If the sketch has been properly inked in, it will show up well against the luminosity of the cardboard.

If a Cavalry sketching board is not available, the sketch should be mounted on a long piece of luminous cardboard.

In preparing this form of sketch the following points must be observed :—

(*a*) The ink should be applied several times so as to make it thoroughly opaque, and should be put on the back of the tracing cloth or paper, so that damp from rain or dew will not smudge the sketch. For the same reason the tracing cloth should be so rolled that the inked side is kept on the inside of the roller, not on the outside.

(*b*) All roads should be indicated by single lines, the route to be followed being made two or three times as thick as other roads which merely branch from it or cross it.

(*c*) Woods or prominent single trees are best shown by small crosses.

(*d*) Gradients should be shown by arrows pointing down the hill ; a slight hill should be shown by one arrow head, a moderately steep hill by two arrow heads, and a very steep one by three arrow heads.

(*e*) Rivers and streams should be shown by a " wriggling " line, and the direction of the current indicated by an arrow.

(*f*) The distance in yards between the chief points should be shown alongside the route.

(*g*) All information on the sketch should be written in block capitals, and, if relating to the route, at right angles to the direction of that part to which it applies.

(*h*) Nothing should be put on the sketch unless it will actually be of use in the night march.

(*i*) "North points" should be drawn at intervals, so that when the sketch is rolled up on the Cavalry sketching board there is always one visible.

(*j*) Silhouettes of any landmarks along the road should be drawn near the features they represent if this can be done without crowding the sketch, but the features other than those mentioned above should be indicated by the usual conventional signs.

To orient or set the sketch so as to read it, place a luminous compass, or, better still, a transparent compass, over one of the North points, and turn the sketch round until the arrow of the compass coincides with the magnetic North shown on the sketch.

Orders.

For form of orders see p. 388.

Each unit should detail an orderly officer for the commander for the purpose of conveying instructions.

Protection.

It is laid down that the force should usually be protected by small advanced and rear guards composed, where possible, of infantry, while the flanks should be protected in an enclosed country by troops or piquets, posted on the side roads by the advanced guard and withdrawn by the rear guard; while in open country they should be protected either by piquets or by flanking patrols, but the latter, unless accustomed to night work, are liable to lose direction.

The distance between the advanced, flank and rear guards and the main body should be small, and the connection between them and the main body should be maintained by means of infantry, or if the ground is suitable, cyclists can be usefully employed in this work.

Position of Cavalry, Artillery, Engineers, and Transport.

In a column of all arms, the cavalry, artillery and machine guns will usually march in rear of the infantry, while all the wheeled transport will march grouped in rear of the whole column, and where they will be least exposed. If obstacles are likely to be encountered, engineers should accompany the advanced guard, carrying the necessary material for either surmounting or demolishing them.

March Formations.

It is laid down that normal march formations, at all events to the position of assembly, will, as a rule, be adhered to unless tactical exigencies require an alteration.

Maintenance of Connection.

In all night operations maintenance of connection is of vital importance. On a night march the principal steps which should be taken to ensure this are :—

1. The advanced guard should, by posting a man at each of them, block all turnings which are not to be used. These men should join the rear guard as it passes them.
2. Officers or N.C.O.'s should always be posted at places where obstacles have to be negotiated. If opening out is likely to occur, it is laid down that the column should advance for a distance about its own length and then half until the rear of the column has closed up again.
3. Should a unit have to drop back for any reason, connecting files must be at once detailed from the head of the unit. For this purpose a unit commander should detail men before-hand so that they may at once go out directly the unit begins to fall in rear.

Not only will these precautions curtail the risk of losing men, but they will also lessen the danger of losing time on the road, which on a night march may be of paramount importance.

Rate of March.

Two miles an hour should be allowed for troops moving on roads, or one mile an hour for troops moving over open country. The pace must be uniform throughout the march.

Halts.

The time and duration of halts should be stated in the night march orders. Each unit before halting should make up any distance it may have lost. It is stated that men may lie down at halts but not leave the road, while mounted men must, of course, dismount and hold their horses.

B. NIGHT ADVANCE.

A night advance is described as a forward movement by a force which is already deployed, and is undertaken for the purpose of gaining ground from which during daylight a further advance will be made. This may be either a preliminary to a battle or to continue one already in progress.

The directions as to previous reconnaissance, maintenance of connection and rate of march in the case of night marches apply equally to night advances. It is laid down that it will frequently be possible, either at dusk or during daylight, to push forward outposts to within a comparatively short distance of the objective and then to deploy under their protection.

It is laid down that the objective of the advance, when gained, should be entrenched, so that it may form a point of support for a further advance next day. For this purpose the troops, when the ground is likely to be difficult to entrench, should carry empty sandbags which, when filled, can be placed in position before daylight.

C. NIGHT ATTACK.

Reconnaissance.

Though a thorough reconnaissance for a night attack often presents great difficulties, it must be undertaken. If it can be done both by day and night, so much the better. It will usually involve some fighting, as it can hardly be expected that in the face of an alert enemy a thorough reconnaissance can be carried out unmolested.

When making the reconnaissance, the position or positions of assembly and also the position of deployment must be selected, and the general compass bearing from the position of assembly to the position of deployment noted, as well as the bearing from the position of deployment to the point of attack. Besides this, the position of the enemy's outposts and the distribution of his forces must as far as possible be ascertained, as well as the nature and position of his entrenchments and the position of any landmarks which might assist the advance. In addition to this, obstacles which have to be surmounted should, as far as possible, be noted, so that preparations may be made for surmounting or demolishing them.

When once a night attack had been decided on, the Japanese, as far as time permitted, and in the case of long arranged attacks, particularly during the 48 hours prior to the attack, left nothing undone in order to find out every detail which might affect the issue. The enemy's position having been examined and his strength as far as possible ascertained during daylight, a small party used to be sent out at dusk to place sticks or flags in the direction to be taken. Connecting files were left out so that, when the advance was begun there was the least possible difficulty in maintaining the correct line. After dark they sent infantry scouts close up to the defensive line to discover its nature and extent, what obstacles there were and how they might best be passed or avoided. By the time the assault took place every man knew what he had to do and how to do it.

Subject to any limitation issued by the commander of the force, every subordinate commander and regimental office responsible for the leading of troops should study with care the ground over which the troops will have to move.

It is further laid down that every officer, when in the proximity of the enemy, should always take advantage of any pause in the operations to gain knowledge of the ground over which he may have to lead his men at night.

With a view to deceiving the Russians, the Japanese sometimes reconnoitred in a direction or position quite different from that in which they intended to carry out the real attack. *For heads of Reconnaissance Report for a Night Attack, see p.* 121.

Orders.

For form of orders for night attack, see p. 374.

Information to be Impressed upon All Ranks.

The orders must be clearly explained to all ranks before they leave the position of assembly. Every man must know :—

(1) The object in view and the direction of the objective ;
(2) The formation to be adopted at the position of deployment ;
(3) The part he has to play ;
(4) His action in case the attack fails.

Everything that can be foreseen should be explained beforehand.

Instructions to be given to the Men.

In addition to this information the following instruction must be repeated by the officer two or three times to the men :

(1) Magazines should be charged and cut-offs closed, but rifles should not be loaded, and no one is to fire without a distinct order ;
(2) Until daylight, bayonets only to be used ;
(3) Absolute silence ;
(4) No striking of matches, no smoking ;
(5) If obstacles are encountered which cannot be surmounted or removed, the men should lie down until a passage has been cleared ;
(6) If hostile scouts or parties are encountered, every endeavour must be made to surround and capture them without noise. They must be rushed in silence.

Guiding Troops by Night.

As a means of guiding troops, marking rallying points, giving alignment, or showing the position of the commander, large discs painted with luminous paint and mounted on poles, with, of course, the dark side to the enemy, may be found very useful.

Maintenance of Direction.

It is essential that the assaulting troops and particularly those who are to press the attack home should maintain their proper direction. Accordingly during daylight all marks or objects which might assist in maintaining direction should be carefully noted. The Japanese often went beyond this and at dusk sent forward a small party under an officer to place sticks or flags in the direction which was to be taken. From the foremost of these marks back to the troops in rear, connecting files were posted so that when the advance was begun there was the least possible trouble in maintaining the correct line.

A plan suitable for a night attack launched from a beleaguered position was adopted by General Baden-Powell, at Mafeking. He had masts erected which were aligned on the point where the attack was to be pressed home. Lanterns were then hoisted on these and the troops by occasionally glancing back were able to maintain the true direction. These lanterns were, of course, visible to the enemy, though he was not aware of their meaning.

General Preparations.

Neighbouring troops should always be informed of any night operations.

To guard against the danger of being exposed in the open when daylight arrives it is best to allow plenty of time before the attack. For instance, presuming daylight to begin about 5 a.m. the attack should be delivered not later than 2 a.m. There will then be time within which to entrench the position or alter existing entrenchments. Even if no definite counter-attack takes place, a certain amount of bombardment is to be expected at daylight.

Accordingly, all necessary materials such as tools, sandbags, wire, etc., must be provided beforehand, and those by whom they are carried allotted a position in the column, usually with the reserve. Working parties should be detailed as well as covering parties, and where possible the distance to which the latter are to go should be specified.

In the case of small bodies of men who can obtain the necessary material, it is a good plan in order to minimise the risk of being heard, particularly when marching on a road, for the men to make rope sandals or overshoes, or cow-hide soles to be tied on to ordinary boots. At Mafeking the men were given rubber shoes.

The men should wear white badges about 4 inches broad on their arms, or some other distinguishing mark, and a password should be arranged. A Japanese General said that though those white bands are difficult to see on a dark night and may be seen by the enemy in bright moonlight, yet they give the men great confidence and for this reason alone are worth carrying.

The Commander of the Force and his staff will also wear easily distinguishable marks.

A very good plan is for the officer guiding the column and all connecting files to have on their backs pieces of luminous cardboard about 12 inches square, or failing cardboard, pieces of white material.

In order to enable the fore-sight to be seen if firing becomes necessary, men should tie a white rag round the muzzles of their rifles.

Articles of kit which rattle or clash should be muffled, and burnished articles dulled. Precautions should also be taken that the artillery and wheeled transport following in rear do not, as has happened on more than one occasion, give warning to the enemy.

All watches should be set by that of the Divisional Commander.

None of these small details must be overlooked, because they may be of extreme importance to the success of a night attack.

Distribution.

It is laid down that attacks delivered in the dark should rarely be attempted, against a simple objective, by a force larger than an infantry brigade, unless the conditions are exceptionally favourable.

Should it be decided to attack the enemy at more than one point, the force which is to deliver the attacks will be divided into separate columns, each column being given a distinct objective.

It is stated that, as a general rule, the assaults should be delivered simultaneously. Care must of course be taken that the different attacking columns do not converge towards one another to such an extent as to run any risk of their meeting or crossing.

If one definite point in the line is selected for attack it is usually advantageous to make secondary attacks about dawn on any other positions from which the point captured can be enfiladed, but if it is impossible for the troops to attack such places, heavy artillery should be brought into requisition.

Maintenance of Connection.

In a night attack, as in all night operations, maintenance of connection, particularly between separate columns who are to deliver simultaneous attacks, is of primary importance.

Since signalling is very unreliable at dusk or just before sunrise, the maintenance of communication between the separate columns and between these and the reserve is perhaps best secured by telephone, though the Japanese found that in some mountainous regions telephones were practically useless. A very thin wire covered with silk was used as a rule, because it was very light, easily carried and rapidly laid, but it was very easily damaged and constantly broken by shell fire, etc. On other occasions the ordinary field telephone was used.

The cohesion of a line may be maintained by each man being required frequently to raise the hand and touch the man on his left.

Position of Assembly.

The position of assembly may be said to be the place where the night march ends and the attack begins.

In cases where troops have to be assembled from a widely dispersed front, orders as to the place of assembly must be issued in good time and before dark, so that the officers leading the troops may have an opportunity of making arrangements and reconnoitring and choosing the route to the position of assembly. But until the troops reach the position of assembly no more should be told them than is necessary. When they do reach this, the full orders can be given.

The most suitable position of assembly would be an open space near some easily recognisable landmark, or one marked in some prearranged manner. Its appearance by night should be noted, and a description inserted in the orders, or, if the destination is intended to be kept secret, communicated direct to the commanders concerned. It should be a space sheltered from the front, where the troops could conveniently halt for a short time, the troops in the rear of the column close up any distance which they may have lost, and the whole adopt any formation for the march to the position of deployment which may have been ordered.

Should the country be very open or both forces in close touch, the position of assembly may coincide with the position of deployment.

March to Position of Deployment.

The formation to be adopted on the march from the position of assembly to the position of deployment should be stated in orders. If the ground is open, it may be in mass or in some other compact formation, but if the movement is confined to roads, column of route will usually be adopted.

The troops who have acted as advanced guard during the march to the position of assembly or lines of scouts, from 50 to 100 yards in advance and on the flanks of the columns, usually afford the best protection to the column. Their duty is to bayonet and overwhelm any of the enemy's piquets blocking their advance, but they must do everything possible to avoid attracting the enemy's attention. The main body should maintain touch with the scouts or advanced guard by means of connecting files. Whatever may have been the distances between the units who are to undertake the attack, the reserves and the general reserve up to the position of assembly, they should, as a rule, from this point onwards be separated by only a short distance.

A mile an hour is a safe pace to allow for troops moving in a preparatory formation to the position of deployment.

Position of Deployment.

The position of deployment should not be less than 1000 yards from the position to be attacked.

The most suitable position of deployment would be a large open space near some landmark easily recognisable, where the whole of the infantry detailed for the attack can halt for a few minutes in order to make sure that all the units are present and can easily deploy for the attack.

Formation for Night Attack.

At the position of deployment the troops adopt the formation in which the attack is to be made. It is laid down that the formation to be adopted must vary with the ground and the special circumstances of each case, and that the following formations have been found suitable.

The force divided into three lines. The first line, which should be preceded at 50 to 80 yards by a line of scouts, may move either in line, in line of platoon, or company columns at deploying intervals. If moving in either platoon or company columns, lateral connection should be maintained by connecting files at about 10 paces interval. Whether to use line or column formation must depend on circumstances. Column formation is on the whole possibly less vulnerable than line formation. If this formation is adopted, the troops should not halt to deploy, but continue the advance, and when the enemy is reached the men will deploy automatically in their anxiety to strike home.

The second line may move in similar formation at about 100 to 150 yards distance. The third line should follow at about 200 yards distance in quarter column, lines of quarter column, or any other convenient close formation. If wire obstacles are likely to be encountered, the men who are to cut the wire should, if practicable, precede the column, and having cut it lead the column through the openings. If this is not practicable these men should follow immediately in rear of the scouts.

It is further stated that the second and third lines may conveniently move on one or both flanks of the first line in order to avoid fire suddenly directed at the first line. The *rôle* of the second line is to act as an immediate support to the first and to resist any counter strokes of the enemy against the flanks of the first line, and the *rôle* of the third is to act as a reserve. The third line must maintain communication with the second, and the second with the first. When an advance or attack is made against several distinct objectives simultaneously, a general reserve will be detailed as well.

General Capper mentions that the formations adopted by the Japanese varied with the ground and other circumstances. The main principle which they adopted was to make the advances in three lines. The first line, preceded at 50–80 yards by scouts and communicating files and, if the conditions made it advisable, by men carrying hand grenades, always advanced in the formation in which it was intended to attack the position. The formations adopted by the first line were usually either line or line of companies at deploying intervals, each company being in column of sections. The second line acted as an immediate reserve to the first, and often moved in line of section columns. The third line, or special reserve, was directly under the orders of the officer responsible for the attack, and was often echeloned on the rear of the flank of the attacking force. There was then no risk of its being masked or of becoming involved in any reverse to the rest of the force. This reserve was used either to entrench any position captured or, in the case of a reverse or counter-attack, to support the first line and check the further advance of the enemy. For this reason it was withheld from the actual fight until its duty was manifest.

The distance between the lines varied according to circumstances.

Position of Cavalry and Artillery.

The general reserve, the cavalry, and, as a rule, the artillery will follow about half a mile in rear of the reserve, usually in some close formation. It is not often that artillery are useful in night operations, but if they have previously taken up their position and if the operations are prolonged and the ranges known, guns may occasionally be able to resist an attack upon a strongly entrenched position. If they are used, great care must, of course, be taken in making arrangements for stopping the artillery fire when the other troops reach their destination.

The Japanese often moved their artillery with advantage into positions which could be entrenched during darkness ready to support an attack in daylight.

The Assault.

If the position of deployment is more than 1000 yards from the point of attack, the troops on reaching a point about that distance from the position will halt in order that the formation may, if necessary, be corrected before the order to advance is given.

When the Japanese attacked, each company was preceded at a distance of 50 yards by scouts whose orders were to give warning, by a preconcerted signal, of the presence of the enemy, and then lie down at once so as to get out of the line of charge or fire.

If any obstacles which cannot be surmounted are encountered in the advance the troops should lie down while those at the head of the column surmount or clear away the obstruction.

Since it will rarely be possible to surprise a disciplined enemy completely when the forces have been in close contact, the assaulting troops must expect to be fired on before the final assault.

If the enemy opens fire the troops must at all costs immediately press forward. It is laid down that so long as it is intended to continue the advance no movement to the rear should be permitted, even to correct mistakes.

Any officer, messenger, or ammunition carrier finding himself in the front line at critical moments must stay there until the critical time has passed. The risk of setting an infectious example by leaving must not be incurred.

The signal for the final rush by all the columns will usually be the firing of a rocket, flare, or bonfire, but this signal will be given in orders. When the signal is seen, all troops will dash forward to the assault, but the reserve will usually be kept in hand until its duty is manifest.

Grenades, when used in night attacks, should be thrown just before the charge takes place.

Ground once taken should always be held. Even if the assault is not successful at night, there is always the chance of it succeeding during the following day. A position once secured should be immediately entrenched.

Pursuit.

Should the attack be successful, the mounted troops will move forward at daybreak and endeavour to get round the enemy's flank with the view of harassing him and causing him as much loss as possible.

If the attack fails, their duty will be to cover the retreat of the infantry.

D. NIGHT DEFENCE.

It is laid down that the general principles of defence by night vary but little from those of defence by day, except that a general counter-attack should rarely go outside the limits of the position, but when an enemy has actually succeeded in establishing himself in the position he should be attacked as soon and in as great force as possible.

It is further stated that this is one of the exceptional cases where artillery may be utilised at night, especially if the front to be defended is narrow and the ground over which the enemy must pass if he wishes to attack is limited.

When taking up a position at night near a ridge the Japanese often preferred a position on the reverse side in order that they might see the enemy crossing the sky-line. They then occupied the ridge at dawn.

When, however, they held a ridge the Japanese on many occasions placed a section or so 100 yards down the slope, and sentries 100 yards beyond them. The enemy was often allowed to get within 50 to 100 yards before fire was opened and grenades thrown.

In Manchuria machine guns were found of the greatest use at night for the purposes of defence. Hand grenades were particularly useful when there was dead ground just under the position.

In order to prevent men firing too high at night, a wire or cord may be erected so that when the men are in the firing position their rifles cover the ground over which the enemy must advance. But unless cords or wires are stretched extremely tight and are so strong as to be comparatively rigid they are useless.

Another plan in order to give a correct alignment is to place two pronged sticks firmly in the ground so that the rifle can be rested on them.

The rule often adopted by the Japanese was not to fire until they knew the whereabouts of the enemy, but when they did know to fire immediately.

PART VI.

FRONTIER WARFARE AND OPERATIONS IN MOUNTAINOUS COUNTRIES.

PROTECTION.

ADVANCED GUARD.

The usual method of utilising the advanced guard for the protection of a force on the march in a mountainous country is to piquet the heights which command the route to be taken by the main body. If necessary, these piquets must entrench themselves until the whole column has passed, and then withdraw under the orders of the commander of the rear guard. Piquets should be numbered consecutively and a slip of paper with its number given to each. On joining the rear guard these slips are given up and the O.C.R.G. knows for certain that he has not missed one. Other troops will be detailed as supports. The piquets should, it is stated, be as small as is compatible with the object for which they are detailed and will usually vary from 4 to 25 men. They should always be within sight of their supports or of the main body, but when that is not possible, sentries should be posted to keep up connection.

If piquets are attacked, all ranks must bear in mind that it is of great importance to hold their posts to the last, so that the column can proceed unmolested.

FLANK GUARD.

The method above indicated of piqueting the route with men detailed from the advanced guard will in itself usually provide sufficient protection. It may, however, be necessary under certain circumstances to detail a special flank guard.

If this is done, the flank guard will usually occupy some defensive position and, if necessary, entrench it, withdrawing in due course in the same manner as piquets detailed from the advance guard.

Ravines which open on to the line of advance must be watched, particularly at night.

REAR GUARDS.

The main body must regulate its pace by that of the rear guard, not the rear guard by that of the main body.

The flanking parties must be withdrawn under the orders of the rear guard commander. Bodies of troops should retire in succession, each body as it retires passing through the lines of those who are covering them.

The men who have formed these piquets will, unless they are required for the immediate reinforcement of the rear guard, be sent forward again. These men, as they move forward, can be utilised, if required, to reinforce the baggage guard.

Mountain artillery as well as machine guns will usually form part of the rear guard, the latter being particularly useful when the artillery are withdrawing. (As to tactical handling of machine guns, see p. 314.)

A medical officer and a portion of the ambulance transport will also accompany the rear guard.

It is laid down that if the rear guard commander finds it impossible to reach camp before nightfall it will usually be best for him to halt before dark and bivouac for the night in the position which is best suited for defence. He should at the same time inform the commander of the force.

If troops are sent on reconnoitring or other similar duties, steps must be taken to guard any defile through which they will have to return. Foraging and similar expeditions should, whenever possible, start at such an hour that their rear guard will reach camp before dark.

A point which should always be borne in mind in retirements is that, if casualties occur, some 4 or 5 men are at once required to carry each of the wounded to safety. This temporarily reduces the fighting strength of a rear guard, and at the same time affords a good target for the enemy. The rear guard should therefore be of sufficient strength to meet this drain. Under ordinary circumstances, however, the continual reinforcement by the piquets may be found sufficient.

OUTPOSTS.

By Day.

By day the system of outposts may be very similar to that outlined in the preceding sections.

Necessity for Special Precautions at Night.

At night, however, outposts in frontier or in fact any warfare in which sniping of the camp may take place on any organised scale, must be arranged so as to guard against this as far as possible.

Strong Outlying Piquets.

It was often found best in Tirah—as Major L. J. Shadwell mentions in his excellent book on North-West Frontier Warfare—to piquet at night the hills on all sides of the camp, from which sniping could take place, at a distance of from 1200 to 1500 yards. Each of these piquets had to be strong enough to hold its own without any assistance from the camp, and for this purpose the position was entrenched and the piquet was amply provided with ammunition.

Since it was not possible for patrols to pass over intervening ground, except at great risk, communication was maintained by lamp signalling.

Inlying Piquets.

The inlying piquets, who slept fully accoutred, were closely drawn round the camp and double sentries were posted every 50 yards or so.

In cases where the enemy is given to rushing tactics these piquets must of course be strengthened.

Reconnaissance.

See pp. 77–83.

ATTACK IN MOUNTAINOUS DISTRICTS.

Mounted Troops on Reconnaissance Duty.

In mountain fighting, the mounted troops must be prepared to work largely on foot, unless they are to delegate the reconnaissance work to the infantry. An officer or non-commissioned officer engaged on reconnaissance will often be able to take his men a considerable distance before dismounting, and then, leaving the led horses with a similar escort, continue on foot ; the men carrying only their rifles and glasses.

When climbing, the pace should be made easy in order to allow the men to fire steadily at any moment. So that the officer or non-commissioned officer may scan each fresh stretch of mountain side coming into view before the line show themselves, it will be best for him to climb somewhat in advance of the men. His eyes should never rest.

Occupation of Ground commanding Line of Advance.

A valley or ravine should never be entered until the high ground commanding it has been occupied. Consequently, parties should always be detailed for this purpose and connecting files thrown forward from the main body to maintain touch with these parties and pass any signals. The main body in the meantime will remain in readiness either to support these parties or to enter the valley if the ground is clear.

Flanking Parties in Attack.

When attacking mountainous ground already held by the enemy, flanking parties should be sent out well in advance of the main line, because they will probably have to climb for some distance before they get actually on or above the flanks of the enemy.

Dangers and Uses of Watercourses.

Where the enemy makes a practice of rolling stones, the watercourses will not as a rule be safe to follow. Advantage must under these circumstances be taken of any facilities or cover which the ground offers; but in places which can not be reached by rolling stones, a watercourse, particularly in a rocky valley, offers excellent cover. Advantage may perhaps be taken of one of the branch watercourses for reaching the desired portion of the crest. So that the sound of the stream may cover the noise which is almost unavoidable with men moving along a rocky stream, a watercourse should be chosen in which, if possible, there is running water. The men must wade through the pools if it obscures them more effectually.

To ascertain if the watercourse would be a source of danger from rolling stones, and whether it extends to the crest of the ridge and not merely to some flat or marshy ground some way below the crest, the non-commissioned officer or scout should reconnoitre, if time permits, to a point where he can see the head of the watercourse. Even when this has been done, it is advisable, when moving the men in Indian file up a watercourse, to send one man some way ahead to reconnoitre. The leading man of the file must keep his scout in sight in order to conform to his signals. At the same time it must be clearly understood that if the stream runs in a gully with steep, unscaleable sides, as so often occurs in mountainous country like Tirah, the party must on no account advance up the gully until the sides have first been occupied.

Precautions against Counter-Attack.

A flanking or storming party should invariably be prepared for a counter-attack, particularly when approaching the crest of a hill. When a flanking party has once gained the crest of a hill they should not immediately press onwards, but should first take up a defensive position, so as to guard the main line as far as possible against a counter-attack.

Advance and Pursuit by Attacking Party.

When the main line has reached the crest, flanking parties should again be pushed out to cover the advance. In performing this duty, they should take advantage of any spurs or shoulders running parallel to the line taken by the main body. No ravine should be entered, even in the heat of pursuit, unless the high ground commanding it has first been occupied by a flanking or other party. It should be borne in mind that a mountainous country offers great opportunities to a rear guard, at little risk to themselves, to prepare ambushes for a pursuer advancing without proper precautions.

The main object of a pursuit, *i.e.* the rout of the enemy and the capture of men and guns, is in mountainous countries often best effected by mounted bodies following some valley parallel to that by which the enemy is retiring. These bodies should attempt to cut off the enemy's line of retreat, or, if that is not possible, they should attempt to pour a heavy flank fire on him when he is passing through some defile, particularly at the moment when he is pressed from the rear by the main body. But if there is no valley which would lead the pursuers to a point where they could cut off the enemy, they should move on the hill-sides, on either of his flanks, keeping well behind the sky-line, and thus press forward to a point where it is possible to intercept him.

Sir Harry Lumsden held that, as regards the N. W. Frontier, the quicker mountaineers are pushed when once they begin to give way, the less resistance are they capable of showing even when on the strongest ground.

Retirement of Attacking Party.

When the retirement of an attacking party becomes necessary, a rapid reconnaissance to decide on the various positions to be successively held by the rear party is, where possible, always advisable. Advantage should in all cases be taken of parallel spurs from which to cover the retirement. All movements should be as quick as possible.

The main principles to be followed by rear guards, duly modified to meet the fact that probably none of the troops will be mounted, have been dealt with on pp. 32–35.

During the retirement of the main body a rear party, whose numbers will vary according to the front covered, must endeavour to hold the first ridge until the main force has passed or at least reached the next ridge. This party will then retire by sections, the remaining sections meanwhile keeping up a fire in order that the enemy may not suspect the fact that the rear party is being gradually depleted. When the first of the retiring sections has reached a favourable point about 200 to 400 yards away, they should halt and cover the retirement of the remaining sections. The whole of the rear party can thus retire by rushes until the next position selected for a stand is reached.

When retiring, a spur will usually be found to offer better cover than a slope.

Sir Harry Lumsden in his Notes on Frontier Warfare recommended the plan of firing a volley from the crest of a ridge, retiring as though downhill but in reality creeping back to await the arrival of the leading files of the enemy, yet not far enough for the men to show their heads over the top of the ridge, and then pouring fire into them.

If not covered by men on parallel spurs, the flanks should be guarded by parties specially detailed. The Officer or non-commissioned officer in command of one of these parties, in choosing the line to be followed should utilise any natural features, such as ridges, for the protection of the flanks during their retirement.

Gaining Positions by Night.

A mountainous country offers great opportunities to small bodies of men who have been trained to hill work to gain a position by night, which position they would hold until supported by a larger force moving up by day. A previous reconnaissance on foot or with one's glasses is almost essential to such an expedition. Compass bearings should be taken by daylight, so that they may be followed at night by means of a compass with a luminous point. If possible, pick out a watercourse or any other physical feature, which would serve in the dark as a guide.

However difficult it may be to see the ground close to one, it is generally possible to see the outlines of all crests against the sky. For this reason, the outlines of all ridges which will have to be crossed and which will each in their turn stand out against the sky, as well as the outlines of all crests in the vicinity of the position to be gained, must be impressed on the mind. It must not be forgotten that the aspect of these crests and ridges will appear somewhat different when viewed from other points which may be passed in the climb.

DEFENCE IN A MOUNTAINOUS COUNTRY.

General Principles.

When a force acting on the defensive in a mountainous country happens to be on higher ground than the enemy, full advantage should be taken of the fact that the defending force is able to observe the enemy's movements, while it is itself unseen, provided that use is made of all spurs on the immediate range which the force is defending.

When scouts on these spurs have located the enemy, it may be possible to move men along the tops, or behind what appears to the enemy as the sky-line, to the point likely to be most threatened, and there to place them unnoticed in position.

Reconnaissance at Dawn and Evening.

For the reason that the first light at dawn catches the tops of the hills some time before it reaches the bottom of the valleys, and, conversely, that the sinking sun lights up the hills for a longer time than the valleys, it must always be remembered that one cannot at those times see from above nearly so easily as one can be seen from below.

Defence against Storming Parties.

Should the slope in front of the defenders offer a clear field of fire, it is usually best, if the enemy attempts to storm the hill, and if there is no tactical reason to the contrary, to reserve the fire until the attackers are within short range, on the chance that they may think the hill undefended and disregard caution. As to firing downhill, see p. 309.

If the enemy attempts to reach the position by means of watercourses or ravines, rocks pushed over the mountain side will either crush him or at least drive him on to the spurs, where he may be more exposed to effective fire.

Should the fire fail to stop them, nothing remains but to develop a vigorous counter-attack just before the assailants gain the ridge, when they are tired by the strain of the ascent. The reserve can be left to deal with any men who actually reach the ridge.

Inasmuch as the steepest hill is often the most difficult to defend, because the men cannot see to shoot down it without exposing themselves—as happened at Majuba Hill—if such a steep hill has to be held, it is best to try and sweep it with fire from ground on the right or left.

Retirement.

The enemy should never, if it can possibly be prevented, be allowed to discover that a retirement is being effected.

In the event of a retirement it is important to keep some men to cover the main body as they fall back, in order to prevent the enemy gaining the position and then pouring a destructive fire on the troops as they retire. This covering party, which should consist of the most active men, must keep up a brisk fire until the remainder have gained a good position to make a stand, when they in their turn should fall back covered by the fire of the others.

If a force is retiring along a spur on a mountain, a parallel spur is often a convenient position from which to cover the retreat.

See also Retirement on p. 289.

Pack Animal Transport.

See pp. 542–562.

Demolition of Frontier Towers.

See pp. 704–706.

PART VII.

FIRE TACTICS, SUPPLY OF AMMUNITION, AND JUDGING DISTANCE.

FIRE TACTICS.

Mounted Troops and Infantry.

Uses of Fire.

Fire is the principal agent in winning battles, and is especially effective when combined with mobility. It should be regarded as a tactical agent and not merely as a means of killing. Battles cannot be won without movement, and fire is the means not only of preventing the enemy's movements, but also of covering or facilitating movement against the enemy. When two opposing firing lines are at close quarters and neither will give way, it is only by superiority of fire that the resistance of the enemy can be broken down and movement be resumed across or around the enemy's position. If an enemy can be immobilised by fire, he may often be enveloped, cut off and forced to surrender. It is occasionally used, particularly by mounted troops, for purposes of deception, but in all cases the prevention or facilitation of movement is the direct or indirect purpose for which it is used. In peace training, as well as on service, fire and movement should always be intimately associated.

Fire Organisation.

Fire organisation is the duty of Battalion and Brigade Commanders. It includes a survey and appreciation of the enemy's principal fire positions, the choice of our own, and the consideration of factors which will either increase or limit the volume of fire.

A few minutes devoted to examination of the ground on which a fire fight is to take place and to preparation for the fight will make a great difference in the effectiveness of fire. Even in a battle of encounter, officers riding in advance of their units may gain valuable information in a few minutes, and although under such circumstances time is of great importance, a delay of half an hour for ground reconnaissance and fire organisation, before approaching effective range, may lead to a material saving of time at a later period.

Before launching an attack, the principal fire positions of the enemy, especially those from which oblique or converging fire can be delivered, should be noted, so that arrangements may be specially made either to neutralise the fire from those positions or to avoid altogether the ground which can be swept by their lines of fire.

Fire positions which are favourable to the advance should also be considered in relation to their bearing on the length and pace of successive movements.

Where part of the ground is covered by crops, scrub, woods, or hedges, etc., which obstruct the line of sight of the advancing firing line, it may be necessary to regulate the advance so that some portions of the firing line can gain the enemy's side of these obstacles before the neighbouring troops advance across the open ground which lies in the intervals.

Ground which is restrictive of fire effect may, in the struggle for fire superiority, seriously limit the volume of fire, while on the other hand, elevated ground in rear of the firing line may render overhead firing safe and so enable an increased volume to be brought to bear.

Dead ground within close range of the enemy's position, and thick cover which will screen movement are both specially important, but where they occur commanders must realise the difficulty of developing all the fire which is available owing to some men using cover for self-protection only, and basely neglecting the obligations of mutual support.

Much will depend on the maintenance of communication with the flanks as well as with troops in rear, and also on thorough arrangements being made for the supply of ammunition. The provision of time for preliminary ranging and orientation, which together should reduce errors in sighting by at least 50 per cent., also fall within the duties of those responsible for fire organisation.

When the slopes of the ground as well as the levels are known, increased fire effect may be obtained by selecting fire positions from which the enemy's supports and reserves may be struck by unaimed fire, viz. that portion of the volume of fire which though it is directed against an objective, such as the enemy's firing line, passes over that objective and takes effect on troops echeloned in rear of it.

The avoidance of ground which is favourable to the enemy's observation as well as the means by which all obstacles should be passed are further subjects for organisation.

In defence, fire organisation includes the consideration of the fire positions which will probably be taken by the enemy, the length and pace of his successive movements, and the organisation of converging fire as well as flanking fire along obstacles and all dead ground. It covers also the choice of positions for machine-guns, the consideration of the possibilities of reserved fire, the arrangement of fire surprise, the provision of reinforcements, the supply of ammunition, the utilisation of unaimed fire against troops on the reverse slopes of the enmy's fire positions, the taking and recording of ranges, the verification of sighting by trial shots as well as the arrangement of numerous artifices to distract the enemy's fire from the real position.

Fire Direction.

In war it is most dangerous to waste ammunition, but on occasions when the tactical situation demands that fire action shall be employed, it may be even more dangerous, and is certainly a much more common fault, to withhold it in the belief that it should only be used when there is a probability of inflicting material loss on the enemy. The opening of fire, the choice of target, the rate of fire to be employed, the formations to be adopted, the strength of the firing line, as well as the rate of movement and several other considerations, depend not only on a correct appreciation of the uses of fire but on a knowledge of the tactical situation, and on skill in regulating fire according to tactical requirements. It is impossible to lead a squadron or company in a fire fight unless this tactical knowledge is combined with technical skill in fire direction on the part of officers and non-commissioned officers, and a sound fire discipline among the rank and file.

Fire Discipline.

Fire discipline implies more than enforced obedience to orders. It embraces also correct action in the absence of orders. This action may be the result of individual reasoning applied for the attainment of a commander's known object, or it may be sub-conscious action produced reflexively in a crisis as a result of drill in peace time. Experience shows that this drill is a necessity, and that men in moments of great danger will act in accordance with habits implanted in peace training. It is therefore necessary to ensure that fire training in peace exercises should be conducted under service conditions as far as they can be reproduced. It is very unwise to habituate men to false conditions which can never be reproduced in war. If false conditions of fire training lead to the creation of false ideals and false standards of fire effect, there can be no skilled fire direction, but only a wrong conception of fire tactics, which must lead to paralysis on the battle-field. Peace training is, in fact, of the utmost value in relation to fire effect on the battle-field, and a careful study of fire tactics should precede even the preliminary lessons of musketry training.

Service Conditions.

On service the effect of the different errors which may be made in firing varies according to the range. Loss of control and nervousness are chiefly apparent at close ranges, while badly trained eyesight has a most detrimental effect at all ranges. Misjudgment of distance and atmospheric influences are of little consequence at close range, but become serious at about 800 yards, rapidly adding to the difficulty of making fire effective as the range increases, so that long-range fire is seldom effective, even though at that range the firers may be themselves secure from hostile fire. If the results of field practices fired in peace time could be reproduced in war, the struggle for fire superiority would be decided at a range beyond 800 yards, but the difference between peace and war results is so great that examination of the difficulties encountered in shooting on service must precede any deductions made from experimental firing in peace time.

Loss of Fire Effect.

The principal trouble in war is the enemy's fire, which produces excitement or other emotions of such intensity that it is doubtful whether in a crisis 5 per cent. of men in a firing line use their rifle sights at all. Leading military writers of all nations agree on this point, and there is unanimity also as to the result of the neglect of aim, viz. that at close quarters rifles are always fired with too much elevation ; secondly, the invisibility of the enemy in modern formations and equipment leads to errors in the selection of objectives, and reduces the effective range of rifle fire for men and untrained eyesight to 300—400 yards. Uncertainty as to the range is a third great difficulty, and, in a less degree, misjudgment of atmospheric influences is also a serious cause of error in sighting elevation. Of minor importance are the allowances to be made for inclination of the line of sight when firing up and down hill, while the constant deterioration of rifle barrels and sights on service is so great that all knowledge of the rifle previously gained in trial shooting may be entirely misleading.

Fire Power.

While shooting on the rifle range in peace time can be transformed into a matter of mathematical accuracy by eliminating all these difficulties, in war partial remedies only can be applied to them, and thus fire tactics is a science dealing with uncertainties and probabilities.

Correct application of fire in the field depends upon a knowledge of the relative influence of various sources of error and the means to be adopted for minimising those errors which are most active in reducing fire effect. This knowledge is acquired either by practical experience of firing under service conditions in peace time, or by studying the results of experimental firing as tabulated at musketry schools. These results are at least ten or twenty times as favourable as can be expected in war, because in peace exercises the first great service difficulty, the enemy's fire, cannot be reproduced. The results of peace exercises are, therefore, used chiefly for comparison with each other and not as standard figures, deductions being made from such comparisons in the light of war experience and knowledge of tactics as practised abroad.

Unless ample allowance be made for the favourable conditions of peace time, standard results of experimental fire are misleading. If any or all of the service difficulties are eliminated, entirely false standards are set up which lead to serious errors in tactics.

Individual Fire Limit.

Marksmanship, or the power of the individual to make his fire effective in war, is limited by inability to see the target beyond short distances, by difficulty in judging distances, and by the impossibility when other soldiers are shooting at the same target, of ascertaining the results of single shots even at the shortest distances. Errors in sighting can only be corrected by observing the result of fire, and observations of fire can, as a rule, only be obtained when fire is concentrated.

Collective fire is necessarily controlled, and control preserves fire discipline, which is of the greatest value at all ranges. Fire should therefore, if possible, be controlled at all ranges, but owing to extended formation and the enormous volume of fire to be met during the advance it has become very difficult to maintain control in attack. Soldiers should therefore be trained, in case control may fail, to select targets, judge distances, and regulate the rate of fire for themselves up to 800 yards. Individual firing at distances beyond about 600 yards can, however, only be justified by exceptional targets and conditions. Individuals are not permitted to open fire beyond 600 yards without orders.

Collective Fire.

When a number of men fire under direction and control at the same objective, their fire, whether it is concentrated or distributed, is termed " collective fire." Collective fire is more effective than individual fire because it is favourable to fire discipline, and also because it is directed with a common object in view and regulated in volume according to the purposes for which it is used. It is directed by fire leaders equipped with field glasses, who can thus make out targets beyond the range of unassisted eyesight, and, if concentrated, it may sometimes be " observed " so that errors in sighting can be corrected. In collective fire, results depend almost entirely on the skill of the fire leader, but the firers must be trained to recognise quickly any aiming point described to them, and to fire steadily in accordance with orders.

Limits of Collective Fire.

Fire is effective when it obtains the desired result: either checking the enemy and making him open fire as a preliminary to further movement, or disturbing his aim so that movement against him is facilitated. Well directed collective fire should be effective against an enemy in the open up to 1400 yards, but this limit would be reduced in close country, and in attack it should be possible, as a rule, to advance to the 1000 yards' zone without returning the enemy's fire. In very open country and clear atmosphere, if the ammunition supply is practically unlimited, as is sometimes the case in organised defence, and if the fire organisation has been thorough, good results may be obtained up to 2000 yards.

The regulation limit of close range is 600 yards, of effective range 1400 yards, of long range 2000 yards, and of distant range 2800 yards.

Opening of Fire.

Fire should only be opened for a definite purpose, generally associated with movement, and it is an axiom of fire tactics that, when it is opened, the necessary amount of ammunition must be expended to secure that purpose. At long ranges, a very large amount of ammunition is necessary to secure results which at shorter range may be obtained with only a few rounds. Therefore it is better, as a rule, to employ long-range fire in defence only, because in defence ammunition is plentiful and the conditions more favourable to fire organisation than they are in attack. In attack, in order that fire and ammunition may be saved, fire should never be opened until the severity of the enemy's fire compels reply. Exceptional targets, such as guns in movement, infantry in collective formation, etc., may, however, justify the opening of fire at long range.

Guns in action are practically immune against frontal infantry fire beyond 1000 yards range; and fire at longer ranges, unless it strikes the guns obliquely, can effect little beyond some interference with the supply of ammunition to the guns.

The volume of fire delivered by quick-firing guns, machine guns, and rifles is now so great that decisive effect may sometimes be produced in a very short space of time by effective fire, and the side which first makes its fire effective in any fight should gain superiority of fire. It is therefore unwise, as a rule, to open a struggle for fire superiority with a weak firing line, which will be overmatched and unable to cover the advance of reinforcements. The great object in fire direction should be—to make fire effective from the opening, and in any unexpected encounter to be the first to produce a heavy volume of effective fire. On the other hand, an extended firing line which is favoured by ground can, with a moderate volume of fire, do much to keep down the enemy's fire and disturb his aim.

Machine guns will be very numerous in future wars, and it will probably be difficult to develop a sufficiently great volume of fire to silence them, even with a dense firing line of one man per yard. They form, however, a vulnerable target when they can be seen at close range.

Selection of Target.

Although advantage should, as a rule, be taken of exceptionally vulnerable targets, objectives should be chosen for tactical reasons rather than for vulnerability.

Fire is more effective when it strikes the enemy obliquely or from the flank. The most decisive agent in war is concentric or converging fire which simultaneously strikes the enemy from two different directions. It is in the production of converging fire that the long range of the rifle is most useful. Converging fire may be produced either by enveloping the enemy's flank while attacking him also in front, or by the employment of oblique fire from two or more separate points in a single line. For decisive purposes it is best, as a rule, to concentrate fire on the points which are to be assaulted or on troops which must be checked, but if all fire is concentrated on important points, there will be no means of keeping down the enemy's fire at other points in his line, and he would be able at these points to fire without molestation, and to direct his fire concentrically and with accuracy against the attacking troops. Hence it is necessary to neutralise the enemy's fire at all points, and accordingly to distribute fire against the whole extent of his front.

To ensure such a distribution of fire that no portion of his line may be neglected, it is best for every unit or individual to select a target straight to the front, some units being detailed for the delivery of converging fire.

In applying this general principle of using concentrated fire for decisive purposes and distribution fire for neutralising purposes, it should be possible to direct the fire of every unit at targets, within certain defined lateral limits, so that fire effect is not reduced through frequent changes of objective and sighting. If the direction of the line of fire remains constant, the results obtained against one target will be a guide to the correct sighting for another, either nearer or more distant. The ground also will be more thoroughly watched and the position of the enemy more definitely located. It is, in fact, very desirable both in attack and defence that every squadron or company should be given fire limits as well as a direction point in advance, these limits to be a guide in choosing targets.

The enemy after each movement should be marked down by every man in the firing line so that he may know the point to fire at, for in war the visible target is, as a rule, not the men themselves, but the ground containing the men. It is by the adoption of method in the selection of targets that alertness can be developed in the firers. If the objective is freely changed, opportunities of striking the enemy while in movement will be lost. The most favourable targets are those which give the best facilities for observation. It is easier to ascertain the effect of fire directed against a moving enemy than at a standing one, and at a target on dry sandy soil than at one in deep soil, clay, etc. If the range has been ascertained to any range marks, fire will always be more effective if directed against the enemy when he approaches a range mark. Nothing, however, must be allowed to prevent the enemy's firing line everywhere being kept under fire.

Range.

Maps and range-finders should be employed, whenever possible, to assist in determining the range. Preliminary reconnaissance with these aids, even if only a few minutes are available, will reduce subsequent errors in judging distances by about one-half. Information may sometimes be obtained from artillery or machine guns, and no means of ranging should ever be neglected.

In defence, sighting may sometimes be verified by trial shots before the action. Range marks should be prominent features of ground which must be passed by one side or the other in advancing. Transverse roads or hedges, or ridges of ground which must be crossed, form the best range marks.

It is sometimes desirable to detail a reliable man to reckon the distance covered during the enemy's advance or to time his movements.

In order that fire may be opened immediately a new fire position is reached, it is best to decide, before it is seized, what sighting will be employed.

Volume of Fire.

The volume of fire must be sufficient for the desired result. It is regulated by varying the number of firers and the rate at which they fire. The rate of fire may be increased either with the object of increasing the volume of fire, or of producing the same volume of fire with fewer men exposed to the enemy's fire. Since the act of firing generally necessitates some additional exposure, the small increase in accuracy, obtained with slow deliberate fire, does not compensate for the increased target surface offered to the enemy by exposing more men to obtain the same number of hits. If rapid fire is well timed and regulated, there is no greater expenditure of ammunition in rapid fire than in slow desultory fire, while the possibilities of surprise with rapid fire are infinitely increased, and the intervals between rapid bursts of fire are of great use in fire direction.

In a fire fight there are two tendencies to be anticipated, viz. (1) the reluctance of some men to fire at all owing to improper use of cover; (2) and the failure to aim owing to excessive rapidity in firing, due to the desire to obtain a mastery over the enemy's fire.

Use of cover and rapid firing are, however, both indispensable, and peace training must be relied on firstly, to impress on each individual the obligation which rests upon him to use cover in such a way that his fire shall at all times be available; and secondly, to develop a correct habit in rapid fire, so that when delivered in short bursts it may not become wild and ill-aimed.

Surprise.

The value of surprise in all operations, offensive or defensive, cannot be exaggerated. To effect surprise, mobility, invisibility, and hard hitting are all required. In attack, surprise effect is obtained by rapidly advancing in force, or concealing movement; in defence by counter-attack, or reserved fire.

Surprise may be brought about by a great volume of effective fire opened suddenly, sharp bursts of rapid fire rather than slow desultory fire, feints and deceptive artifices of various kinds, night operations, dismounted fire, machine guns, etc. Smokeless powder, magazine rifles, quick-firing guns, machine guns, and tactical changes generally, render reconnaissance difficult and surprise easier.

Reservation of Fire till Decisive Range.

If fire is reserved until the attack is within say 600 yards of the position, the moral effect on the enemy of losing 10 per cent. of his men in a few minutes is much greater than if the same loss is spread over the time occupied by his advance from 1000 to 600 yards.

Probability of Error.

Fire effect varies very much according to the skill displayed by leaders in fire direction, the maintenance of fire control, and the standard of fire discipline. Fire can only be justified if it produces the moral or material effect which is desired. To avoid waste of ammunition, leaders must possess some knowledge of the expectation of error in shooting under various conditions and at different distances.

If the average amount of error is determined by a prolonged series of tests and experimental shooting, a rough guide will be obtained as to the fire effect which may be expected, under certain known conditions, and, if all the circumstances of each case are then considered and allowance made for the influence which they have exercised, conclusions may be drawn as to the true value of fire in war. The enemy's fire, fatigue, hunger, rapidity of fire or movement, worn rifle barrels, comparative invisibility of target, gusty weather, half-trained troops, are the principal factors which increase the probability of error, while ground reconnaissance, organisation, determination, confidence and favourable conditions of target, weather and weapons decrease it.

The average error in judging distance up to 1400 yards, without assistance from maps or range-finders, is about 15 per cent. of the distance, the error being less at short distances and more at longer ones. This error may, by the use of maps, be reduced to 10 per cent., or even less. Although the majority of bullets pass over the targets, distance is in war generally under-estimated. Ranging is essentially dependent on skill and forethought. The average error in ranging with instruments (range-finders) is about 5 per cent. of the distance, but if ample time is available for using the instruments, better results may be obtained. At distances beyond 1000 yards, mistakes in judging atmospheric influences may lead to an error in sighting elevation amounting to about 7 per cent. of the distance. The mean error in collective shooting is, on level ground, about 40 yards at 1000 yards range, so that at close range errors in fire direction are much greater than errors in shooting. The mean errors which are here mentioned are those of peace exercises.

Fire is said to be effective, generally speaking, when the target is included within the space of ground on which 75 per cent. of the bullets, nearest to the centre of the cone of fire, fall. Bullets in concentrated collective fire fall in a group, making a pattern which may be regarded similarly to patterns made by pellets from a sporting gun. In any particular case it is found that they are grouped irregularly, but in any series of collective fire exercises, it is found that the grouping is very regular and admits of measurement. In concentrated fire, the approximate grouping measurement on level ground of 75 per cent. of bullets is, at 500 yards range, about 220 yards in depth by 7 feet in width ; at 1000 yards about 120 yards by 14 feet ; at 1500 yards about 100 yards by 22 feet ; and at 2000 yards about 160 yards by 46 feet.

If an error in sighting elevation is made which exceeds half of the depth measurement given above, the target will not as a rule be included in the effective portion of the bullet cone, and such fire may for any material purpose be regarded as ineffective.

To increase the chance of fire effect at ranges beyond 1000 yards, on occasions when observation is impossible, combined sights are used. For combined sights a volume of fire equal to that of at least a company is necessary. The firers use two elevations differing for each half-company by 100 yards ; this gives a depth dispersion about 50 per cent. greater than that obtained with one sighting. The need for limiting long range fire, unless the range and atmospheric influence can be verified, is apparent, since it involves an enormous expenditure of ammunition to ensure that fire will be effective.

Lateral errors are such that concentrated fire against extended formations is of comparatively little effect, and therefore it is generally better against linear targets to distribute fire laterally. Experiments indicate, generally, that intervals of 3 or 4 paces in extended formation are sufficient to reduce materially the effect of the enemy's aimed fire.

Atmospheric Influences.
Error of Day.

Wind and temperature are the two principal atmospheric sources of error; both affect sighting elevation. Since side winds require an allowance to be made for deflection, a few simple tables to assist in fire direction should always be remembered.

Divide winds into 3 classes—Mild (10 m.p.h.), Fresh (20 m.p.h.), and Half a gale (30 m.p.h.).

At 500 yards allow 2, 3½, and 5 feet deflection respectively for right-angle winds of these three classes. Deduct, or add, if the distance is less or greater than 500; halve the allowance, if the wind is blowing obliquely.

Allow 3, 6, and 9 yards respectively for right-angle winds blowing 10, 20, and 30 m.p.h. respectively, at 1000 yards. Double these allowances at 1500 yards and quadruple them at 2000 yards.

Yards.	10.	20.	30 m.p.h.
500	2 ft.	3½ ft.	5 ft.
1000	3 yds.	6 yds.	9 yds.
1500	6 ,,	12 ,,	18 ,,
2000	12 ,,	24 ,,	36 ,,

Cold weather slightly increases the elevation required, hot weather decreases it.

At distances less than 1000 yards ignore head and rear winds, but if two influences (wind and temperature) are acting in the same direction, allow plus or minus 50 yards ; thus, for rear wind and hot weather, reduce elevation by 50 yards.

At distances between 1000 and 1500 yards, allow plus or minus 50 yards for either head or rear wind and 50 yards also for hot and cold weather.

Beyond 1500 yards, it may be necessary to allow as much as 150 yards in sighting for the error of the day alone.

In individual fire, atmospheric influence need not be considered except as regards side winds. In order to hit narrow targets, such as individuals in an extended line, soldiers are taught to make allowance for side winds by aiming off the target.

Beyond the individual fire limit, deflection allowance is unnecessary when shooting at linear targets, but when the objective is a narrow isolated target, fire leaders make the necessary allowance by directing their units to aim off the objective, or better still by selecting an auxiliary aiming point near it. If orders are given to aim off, some guide should be given to the firers in judging the required allowance, preferably by referring to the breadth of the target or the intervals between the guns, groups, etc., and not by naming the number of yards right or left.

Allowance for atmospheric changes due to altitude above sea level should be made in accordance with the instructions contained in the regulations. Altitude cannot be altered materially in one day's fighting, and this allowance can therefore be determined at leisure.

Inclination of Line of Sight.

It is unnecessary to make allowance in elevation when firing up or down hill at distances below 500 yards or even when firing at greater distances, unless the slope exceeds 10 degrees.

Cases in which the slope exceeds 10 degrees and the range is greater than 500 yards, are very rare, but in such conditions, whether the target is above or below the firer, sighting should be reduced by 50 to 150 yards according to the range and slope of the line of sight.

Indirect and Night Fire.

The angles of elevation and arrival of the bullet at 500, 1000, 1500, and 2000 yards, and the culminating points of the trajectories at these distances should be committed to memory (see pp. 316–318), also the distance at which the sound of discharge overtakes the bullet used by the enemy.

Skill should also be acquired in judging distance by sound and flash, and in firing by night at illuminated aiming marks giving a horizontal line of sight or a known angle of sight. Practice in bringing the rifle to a horizontal position in the shoulder, when aiming at night, can be obtained by shutting the eyes until the rifle is in position and then opening them and seeing if the rifle is aligned on some point level with the eye; but firing in night operations is exceptional.

A general knowledge of the effect of ground slopes on fire effect is indispensable, and may be obtained from the musketry regulations.

Cover from Fire and exposure to unaimed Fire.

The angles of arrival and penetration of the enemy's bullets into various substances should be known (see p. 716) and reverse slopes conforming to the enemy's trajectories should be avoided. Defiladed zones may often be found close behind crest lines when ground further back is swept by unaimed fire. Troops exposed to unaimed fire should, unless cover from fire can be obtained by deployment or extension, form in narrow fronted columns.

MACHINE GUNS.

Characteristics.

Opportunities for surprise and the use of converging fire have become more frequent in recent years, owing to the increased range of weapons, the introduction of smokeless powder, and the adoption of quick-firing appliances in rifles and field guns. Mobility, concealment, and a great volume of fire, suddenly and effectively delivered, are the principal agents of surprise, and machine guns possess several attributes which make them specially suitable for producing it. They are very mobile off the battlefield, offer a target very small, both in respect of vulnerability and visibility, and deliver a volume of fire at least ten times as great per yard of frontage occupied as that of a firing line armed with rifles. In accuracy they compare very favourably with rifles, and since they are mounted on tripods, which possess no nervous system, they may be expected to reproduce in war the accuracy of the practice range much more nearly than a number of men armed with rifles.

As a guide to the tactical handling of machine guns, it is necessary to bear in mind their principal characteristics and defects.

Advantages.

Their mobility makes them suitable for advanced and rear-guard work, and also for retention as a mobile reserve of fire power. Their mounting renders them reliable in a crisis and gives them an all-round traverse ; it also enables a detachment to use clinometer elevation, both for indirect and night firing. The narrow front and all-round traverse make them suitable for a flank position, either in attack or defence, and for a flanking position in field fortification.

The invisibility of the gun when in position, its small target surface, and its reserve of men at hand, ready to take their turn in serving the gun, make it relatively invulnerable. The mounting and fixing arrangements facilitate immediate application of fire against targets which appear suddenly, and disappear after a short period of exposure.

The normal dispersion of fire is somewhat less than that of collective rifle fire, but this is favourable to observation of results, and therefore to correction of sighting. The traversing gear is of great value when firing at linear targets, such as firing lines, parapets, etc., or against charging cavalry.

The concentration of so much fire power in one weapon facilitates direction of fire for either concentration, distribution, or any tactical purpose. The accuracy of the shooting and reliability of the mounting justify overhead fire with the machine gun when it would be unsafe with the rifle.

In comparison with its fire power, a machine gun detachment requires comparatively little transport and supplies.

Its hard-hitting and possibilities for surprise justify great risks, the loss of a machine gun being easily made good. It is therefore used in detached work, reconnaissance, and protective duties, in holding the ground until other troops arrive, in relieving men on outpost duty and making good captured positions, and in reducing the number of rifles which are required in exposed positions.

The value of the gun for overhead firing indicates that it will often be used for covering fire, but this need not result in premature opening of long-range fire. Fire should rather be reserved until the struggle for superiority of fire begins, and then the sudden opening of a number of machine guns concentrated on any point which is to be assaulted should greatly aid the forward movement at close range.

Defects.

The chief defect of machine guns, and one common to all of them, is the frequent jamming or failure in automatic fire. This defect can only be met by thorough training and scrupulous adherence to routine duties; but since jams are to be anticipated, even with an expert detachment, no machine gun should ever be detached by itself. The section (2 guns) should never be subdivided, and in action the guns should, as a rule, fire alternately.

Another defect is the noise peculiar to these guns, and the cloud of steam which arises from the water-jacket when fire is maintained continuously for about a minute. This defect, as well as the delicacy of the mechanism, renders it desirable that the guns should be fired intermittently and reserved for special opportunities and for crises.

Probability of Error.

When used for long-range fire, machine guns should be massed, as a section of guns cannot justifiably be used beyond effective range unless circumstances give an abnormal degree of assurance that fire will be effective.

Machine guns differ considerably in their patterns of grouping. Tripods also differ, and the ground under the tripod exercises some influence on the density of the fire cone. It is necessary to ascertain the depth dispersion of automatic fire of each gun of a section, and of the two guns collectively, when firing with sighting elevation differing for each gun by 50 yards. This information, especially in relation to probable errors in sighting and locating the enemy, will furnish the required basis for fire direction. As with rifle fire, the greater the probability of error in sighting elevation or in locating the enemy, the greater must be the volume of fire employed, in order to give the degree of assurance which is required to justify the opening of fire.

Since machine guns are organised in sections of two guns, and massing is the exception rather than the rule, it is essential that a good range-finder should be in use with each section, so that, unless observation of results is probable, the decision to open fire may be based on the accuracy of the range-finder, and not on estimation by eye only.

If it is imperative to open fire with a section of guns against a concealed enemy, or at such a range that the probable error in sighting exceeds the permissible error, when firing with combined sights, distribution in depth may be obtained by vertical sweeping fire or progressive elevations.

In vertical sweeping fire, each gun should be given a sector about 100 yards broad at the nearer limits of the zone to be swept, which should be about three hundred yards in depth. In progressive elevations the sights should be raised or lowered after each zone is swept with combined sights, but the changes should be made at short intervals and irregularly, so that the enemy may not be able to foresee the sweeping of any particular zone, and to take cover accordingly.

Massing.

When systematic distribution or concentration of fire is desired, as may often be the case in battles of position, the 8 guns of a brigade may possibly be massed into a battery, or 2 half-batteries; otherwise they receive their orders from regimental or battalion commanders, a considerable measure of independent action being allowed. It must be borne in mind that massing may result in loss of opportunities for surprise effect and converging fire.

Tactical Handling.

The following conclusions as to tactical handling are drawn from the foregoing considerations.

A proportion of machine guns will generally form part of advanced guards, and will, if required, seize positions and hold them until the main body arrives, when they will remain in rear of the firing line.

In attack, they may follow the firing line, some hundreds of yards in rear, keeping concealed and gradually closing on the firing line during the approach to close range, endeavouring to find positions for overhead fire about 200 yards in rear of the firing line and towards the flanks of their unit, whence they may use converging fire and be ready to meet any counter-attack. They should open suddenly to support the advance at close range, and should engage in the struggle for superiority of fire, moving rapidly forward to hold the enemy's position if it is taken.

In prepared defence, a few machine guns should be placed in position to enfilade or sweep dead ground, obstacles, gates, hedges, or any line of approach or defence giving a deep or narrow target. The majority of the available guns should not be placed in the first line of defence, even though positions be prepared for them, until the enemy's intentions are disclosed, but should be regarded as a mobile reserve. This condition may, however, be modified in the near future should the proportion of machine guns to rifles be increased. Positions for guns held in reserve should generally be selected on the flanks of defensive sections so that converging fire may be brought to bear across the front of the sections, the flanks being also protected against enveloping attacks.

Range Limits.

It will generally be best for machine guns to reserve their fire in defence until stopping effect may be expected—say, 1000 yards' range if the enemy advances in an extended line, or for annihilating effect at close range. Fire at longer ranges may be opened if the correct sighting has been verified, if observation is probable, if exposure of position is improbable, or if sufficient guns are massed to justify long-range fire.

Fire Positions.

Positions for machine guns should give a good field of fire, concealment, and covered approach for ammunition; should not offer to the enemy facilities for ranging or observing his fire; should be sufficiently high to justify overhead fire, and should provide cover from fire for at least the spare numbers.

Machine guns should not be placed in the firing line where they would lose their power of fire to either flank.

Preparatory Measures.

Detachments should be skilled in carrying their guns,

DIAGRAM 7.

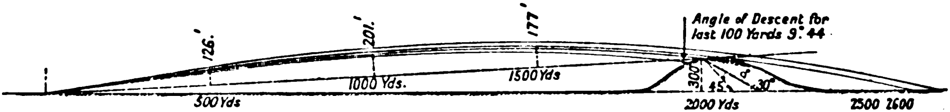

126'
201'
177'
Angle of Descent for last 100 Yards 9°.44
500 Yds
1000 Yds.
1500 Yds
300
45
30°
2000 Yds
2500 2600

FIG. 1.—Trajectory of bullets fired at a position 300 ft. high and 2000 yds. distant.

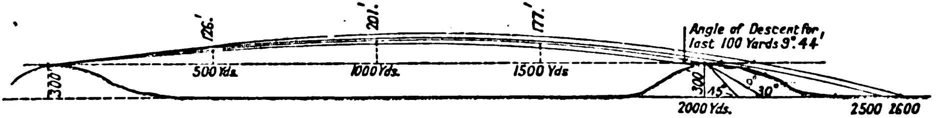

126'
201'
177'
Angle of Descent for last 100 Yards 9°.44'
300
500 Yds
1000 Yds
1500 Yds
300
45
30°
2000 Yds.
2500 2600

FIG. 2.—Trajectory of bullets fired from a hill 300 ft. high at a position 300 ft. high and 2000 yds. distant.

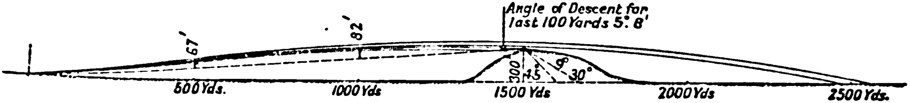

67'
82'
Angle of Descent for last 100 Yards 5°.8'
300
45
30°
500 Yds.
1000 Yds
1500 Yds
2000 Yds
2500 Yds.

FIG. 3.—Trajectory of bullets fired at a position 300 ft. high and 1500 yds. distant.

In each figure—
3rd line shows trajectory of bullet fired with correct elevation.
Top ,, ,, ,, too much elevation (+ 150 yds.).
2nd ,, ,, ,, ,, ,, (+ 50 yds.).
4th ,, ,, ,, too little ,, (— 100 yds.).

(*Drawn to scale.*)

DIAGRAM 8.

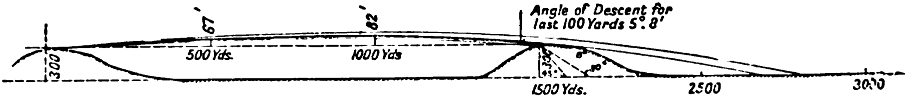

Angle of Descent for last 100 Yards 5° 8'
67'
82'
300
500 Yds.
1000 Yds
300
8°
30°
45°
1500 Yds.
2500
3000

FIG. 1.—Trajectory of bullets fired from a hill 300 ft. high at a position 300 ft. high and 1500 yds. distant.

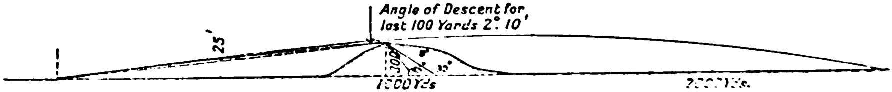

Angle of Descent for last 100 Yards 2° 10'
25'
300
8°
35°
1000 Yds
2000 Yds.

FIG. 2.—Trajectory of bullets fired at a position 300 ft. high and 1000 yds. distant.

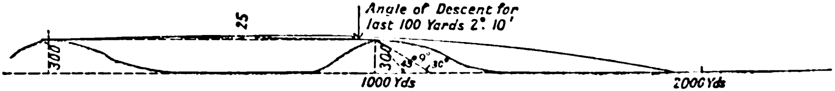

Angle of Descent for last 100 Yards 2° 10'
25
300
300
9°
30°
45°
1000 Yds
2000 Yds

FIG. 3.—Trajectory of bullets fired from a hill 300 ft. high at a position 300 ft. high and 1000 yds. distant

In Figs 2 and 3 .
Lower line shows trajectory of bullet fired with correct elevation.
Top ,, ,, ,, too much elevation (+ 150 yds.).

(*Drawn to scale.*)

DIAGRAM 9.

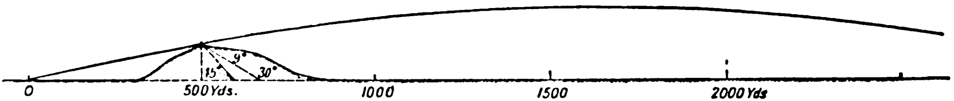

15°
9°
30°
0
500 Yds.
1000
1500
2000 Yds

FIG. 1.—Trajectories of bullets fired at a position 300 ft. high and 500 yds. distant.

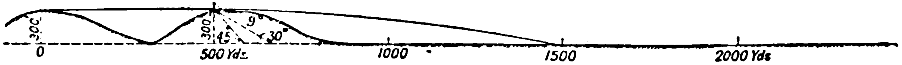

300
300
45°
9°
30°
0
500 Yds.
1000
1500
2000 Yds

FIG. 2.—Trajectories of bullets fired from a hill 300 ft. high at a position 300 ft. high and 500 yds. distant.

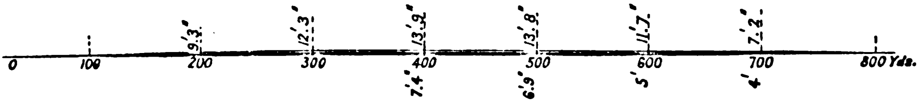

9'.3"
12'.3"
13'.9"
13'.8"
11'.7"
7'.2"
0
100
200
300
400
500
600
700
800 Yds.
7'.4"
6'.9"
5'
4'

FIG. 3.—Trajectories of round-nosed (top) and pointed bullet (middle line) at a range of 800 yds.

In Figs. 1 and 2—
Lower line shows trajectory of bullet fired with correct elevation.
Top " " " too much elevation (+ 150 yds.).
Fig. 3.—Angles of descent of pointed bullets at—
500 yds. . . . . ½°. 1000 yds. . . . . . . 2°.
1500 yds. . . . . 5°. 2000 yds. . . . . . 13°.

(*Drawn to scale.*)

tripods, and ammunition rapidly and without exposure to the fire position, and in range taking, serving the guns, observing fire, and supplying ammunition without exposing the position which has been occupied. Positions should not be changed unnecessarily. Gun pits should be dug in a circular or horseshoe shape, and sufficient earth should be left to a depth of about 2 feet to support the tripod, but round this earth a deep trench should be dug to enable the firers to move round the flanks and rear of the guns. The two guns of a section should be placed about 15 yards apart, and connected, if time permits, by a zig-zag trench to contain the spare numbers.

Screening, dummy targets, alternative emplacements, preparation of the ground adjacent to the guns with a view to baffling observation of results, and measures for reducing the amount of steam given off in continuous fire should, if possible, always be undertaken.

SUPPLY OF AMMUNITION IN THE FIELD.

HOME.

General Organisation.

Sources of Supply in the Field.

It is now laid down as a fundamental principle that, in the supply of ammunition, the impetus should be given from rear to front. Troops in action should never have to turn their backs on the enemy to fetch ammunition. What they require should be sent up to them on the initiative of the troops in rear.

The following are the sources of supply in the field according to "Field Artillery Training, 1908," and "War Establishments, 1914," and "Infantry Training, 1914," counting from the base to the front:—

1. The administrative services on the line of communications. Ammunition is stored in magazines at Advanced and Base Ordnance Depots. It is conveyed by rail to railheads, where it is loaded on the

Ammunition Parks (M.T.). These Parks proceed to rendezvous fixed by General, Army or other Headquarters, and from there they are conducted to Refilling Points, where they transfer ammunition either to Divisional Ammunition Columns or direct to Brigade Ammunition Columns.

2. The divisional ammunition column reserves replenish all the artillery brigade ammunition columns, and are in charge of the divisional artillery commanders.
3. The Artillery Brigade ammunition column reserves:—
   - (*a*) A Horse Artillery Brigade Ammunition Column, which carries gun ammunition for its two batteries and S.A.A. for two brigades of cavalry and a proportion of the divisional troops.
   - (*b*) An Ammunition Column of the Horse Artillery with a Cavalry Brigade, not allotted to a Cavalry Division, which carries gun ammunition for its battery of Horse Artillery and S.A.A. for the units of the Brigade.
   - (*c*) A Field Artillery (Howitzer) Brigade Ammunition Column, which carries ammunition only for the batteries of its own brigade.
   - (*d*) A Heavy Artillery Battery Ammunition Column, which carries ammunition only for its own battery.
   - (*e*) A Field Artillery Brigade Ammunition Column, which carries gun and S.A. ammunition for the batteries forming the Brigade and for one of Infantry brigades of the Division, as well as for a proportion of the divisional troops.
4. Infantry brigade ammunition reserve.

Field Artillery Brigade Ammunition Columns carry 80 rounds, divisional ammunition columns 50 rounds, and divisional ammunition parks carry 100 rounds S.A.A. for each infantry soldier. Horse Artillery Brigade ammunition columns and Cavalry ammunition parks each carry 100 rounds S.A.A. for each cavalry soldier.

5. The divisional ammunition columns, the first link in the chain connecting the guns and rifles in the firing line with the administrative services at the refilling points, usually march one day in rear of the fighting force and during an action establish headquarters at their respective refilling points, pushing sections forward to connect with their brigade ammunition columns. (Field Service Regulations, Part I., s. 159, and Field Artillery Training, s. 79.)

6. The field artillery brigade ammunition columns, in each of which a section is allotted to carry ammunition for one infantry brigade, furnish the second reserve of small arm ammunition. When there are less than three field artillery brigades in the divisional artillery, the second reserve of S.A.A. will be distributed among the field artillery columns and detached to follow infantry brigades as required.

In an emergency in action, ammunition from these columns must be supplied to any troops on demand, yet normally the infantry brigade which each is to supply is detailed in divisional orders, so that the column commanders may know whom they have to supply and each infantry brigade know whence to expect replenishment.

These brigade ammunition columns usually march immediately in rear of the fighting troops of their respective divisions, unless circumstances render this undesirable. During an action they are established, by artillery brigade commanders, in positions favourable for communication and movement, about one mile from the first position of the line of guns, the columns being split up into sections should the wide extension of the troops to be supplied render such a course necessary.

7. The brigade ammunition column commander on approaching the battle-field will :—

(i.) send forward an officer or non-commissioned officer to ascertain the position of the troops which he has to supply;

(ii.) detach an orderly to remain with the commander of the infantry brigade ammunition reserve (see pp. 322, 324) until there is no longer any probability of ammunition being required;

(iii.) during the action send forward ammunition under an officer, as demanded by the commander of the infantry brigade ammunition reserve. The transport conveying this ammunition will normally be unloaded and returned to the brigade ammunition column as soon as possible. When the ammunition is carried in S.A.A. carts it is transferred as a rule to the empty carts, which are withdrawn if necessary to a covered position for the purpose. Should this not be feasible the artillery teams may be transferred to, and returned with, the empty carts. (Field Service Regulations, Part I., s. 160.)

Horse Artillery Brigade Ammunition Column.

The ammunition column of a horse artillery brigade is organised in two sections, so that, if a cavalry brigade and a battery are detached, one section can accompany them, carrying the supply of ammunition allotted to both.

Unless special circumstances render it undesirable, the ammunition column marches in the rear of the combatant troops and ahead of the baggage.

Infantry Brigade Ammunition Reserve.

The infantry brigade ammunition reserve is carried in eight S.A.A. wagons or carts, each of the four battalions in the brigade finding two of these vehicles. They follow in the rear of the brigade, and are under the command of a mounted officer specially detailed for the purpose.

Supply of a Cavalry Regiment.

One hundred rounds are carried by each man.

The ammunition reserve of a cavalry regiment is carried in:

(*a*) Three S.A.A. wagons. Of these, three wagons each carry 33 boxes of ammunition, thus giving a reserve of about 100 rounds per man. These three wagons march in rear of the regiment, and are under the charge of a N.C.O. detailed for the purpose.

The reserve of S.A.A. carried for the cavalry in the brigade ammunition column amounts approximately to 100 rounds per man, with the same amount in the divisional ammunition column.

(*b*) Two wagons, which carry the two machine guns, tripods, two sets of machine gun pack-saddlery (six pack saddles), and 19,500 rounds of ammunition.

These wagons march in rear of the regiment, and are under the charge of the O.C. machine-gun section. Ten thousand rounds are carried in the brigade ammunition column, and the same number in the divisional ammunition column.

Supply of a Yeomanry Regiment.

The supply of a Yeomanry regiment on service should be the same as for a cavalry regiment.

Supply of an Infantry Battalion.

According to "Infantry Training, 1914," the small arm ammunition available in an infantry battalion consists of:—

1. *120 rounds carried by the soldier.

* 100 rounds, regimental reserve, carried for each rifle partly on eight pack animals (two per company) and the remainder either in small arm ammunition carts or on pack animals. 3,500 rounds are carried in the limbered wagons of the machine gun section. 8,000 rounds reserve ammunition are carried in the S.A.A.

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* In India the numbers differ chiefly owing to pack transport requirements, but the principles are the same.

cart of the section. The total rounds to be maintained in the field is 550 per rifle. The whole of the ammunition allotted to infantry battalions in War Establishments, India, is carried on pack transport. The reserve ammunition of the machine-gun section is carried separately.

2. A brigade reserve will normally be formed by detaching from each battalion about a third of its regimental reserve ammunition, under a specially selected officer. The brigade reserve forms a link between the regimental reserve and the artillery brigade ammunition column. It should be regarded as available for the brigade generally and also in the case of necessity it will supply ammunition to any troops engaged. This reserve marches in rear of the brigade and during an action moves as the brigade commanders may direct. It should be accompanied by signallers or orderlies according to the nature of the country, to maintain communication between it and the various regimental reserves.

In the event of a brigade in action being ordered to advance through woods or over broken ground where communication can not be maintained, the brigade reserve may be distributed between battalions.

If battalions are detached to any distance a similar course would be pursued, a brigade reserve being re-formed as soon as possible.

3. The commander of the brigade ammunition reserve will:—

(i.) Open up communication as soon as possible with the brigade ammunition column and also with the various regimental reserves;

(ii.) Employ the orderly sent him from the brigade ammunition column only for the purpose of communicating with that column. He will communicate with the regimental reserves by means of signallers where possible or failing this by orderlies furnished from units in the brigade;

(iii.) Take the earliest opportunity (when about half the ammunition with the brigade reserve has been issued, or sooner if necessary) to fill up empty transport from the brigade ammunition column. The request for the amount of ammunition required will be sent, in writing, to the officer in charge of the small arm ammunition section of the brigade ammunition column by the artillery orderly furnished for that purpose, who will also act as guide to the officer bringing them forward. When the ammunition is carried in small arm ammunition carts, the number of full carts required will be demanded ;

(iv.) Not send men and transport animals belonging to the infantry brigade reserve to the brigade ammunition column, nor men and transport animals belonging to the latter further to the front than the infantry brigade reserve, except in the case of emergency ;

(v.) Retain empty transport in the infantry brigade reserve until unloaded or replaced ;

(vi.) Sign receipts prepared by the officer in charge of the brigade ammunition column for the number of full carts received, if the ammunition is forwarded in small arm ammunition carts, or for the number of full ammunition boxes if the ammunition is forwarded by other transport ;

(vii.) After an action or during a pause in the engagement make good all deficiencies of ammunition from the brigade ammunition column.

4. Whenever a collision with the enemy is probable battalion commanders will, on their own responsibility, issue 50 extra rounds a man from their regimental reserves, taking the necessary steps to replenish their reserves as soon as possible from the brigade reserve.

5. The ammunition transport remaining with each battalion

after the brigade reserve has been formed normally marches in rear of the battalion. On deployment the transport carrying the machine-gun ammunition moves as directed by the officer commanding the machine-gun section. The regimental reserve not allotted to companies will be under the sergeant-major, will, to commence with, be retained in the hands of the battalion commander, and will move as directed by him. The exact distribution in action of the regimental reserve must depend, in a measure, on the nature of the ground. The object is to maintain the power of replenishing the supply from the brigade reserve, whilst getting the regimental reserve as far forward as possible so as to facilitate the supply of ammunition to the firing line. During the final stages of the attack every opportunity of gaining ground must be seized, so that the regimental reserve may be at hand as soon as the position is carried. The sergeant-major will remain with that part of the regimental reserve which is most suitably placed for maintaining communication with the brigade reserve; he should be provided with signallers, and orderlies when necessary, for the purpose of maintaining communication with the remainder of the regimental reserve and with the brigade reserve. As the regimental reserve becomes empty it will be refilled or exchanged, under the direction of the sergeant-major, from the brigade reserve.

6. The ammunition pack animals allotted to companies join their respective companies on the deployment of the battalion and if companies are detached their ammunition pack animals will accompany them. Each company commander will detail one non-commissioned officer and two or three privates, according to the strength of the company, as ammunition carriers, to issue the ammunition so carried, strong, active men being selected for this purpose. On the march, battalion commanders may direct one of these men to accompany their respective ammunition pack animals to assist the driver in adjusting

loads, etc. The remaining company ammunition carriers will join the pack animal of their company when the battalion is deployed or a company is detached. The non-commissioned officer in charge of the company ammunition carriers will then direct the movement of the company pack animal in accordance with the orders of the company commander, and will endeavour to keep as close to his company as possible. The non-commissioned officer will remain with the company pack animal throughout an engagement, and when his own company is absorbed in the firing line he will place his pack animal in the most favourable position for the issue of ammunition to the successive reinforcing lines.

7. When men have once joined the firing line they cannot be withdrawn save under very favourable conditions of ground Ammunition carriers should, therefore, normally be employed for the issue of extra ammunition to supporting lines prior to their losing touch with the battalion ammunition reserves Those belonging to companies finding the firing line may, however, be employed during the initial advance to carry forward a further supply of ammunition, if required, prior to the actua reinforcement of the firing line.

8. Commanders of companies in supporting lines will therefore carefully watch the progress of the pack animals and small arm ammunition carts, and prior to losing touch with these reserves, ensure that the first and subsequent reinforcements to the firing line are issued with ammunition for their own use and that of the firing line.

The amount of extra ammunition so issued to the men o successive lines must depend on :—

(i.) The expenditure at the front.
(ii.) The cover afforded by the ground to these reinforcements in their advance to the firing line.
(iii.) The amount of ammunition which a man can carry without impairing this efficiency.

Open ground, in the face of a heavy fire, must be crossed by short rushes at top speed. For such an advance activity is the first consideration and men should not be called upon to carry more than 300 rounds, except when the ground can be crossed in a single rush.

9. Section and squad commanders will ensure that all ammunition from killed and wounded is collected and distributed.

AUSTRALIA.

Supply of Ammunition in the Field.

Brigade Ammunition Columns will be formed on mobilization to provide a reserve of ammunition for all arms, and a reserve in men, horses, and material for the Artillery. A Field Artillery Brigade Ammunition Column forms an integral part of a Field Artillery Brigade. The Commander will be responsible that a due supply of ammunition is present, during an engagement, within reach of the battery wagon lines and of the Infantry S.A.A. Reserve. Ammunition Columns are also to issue ammunition to any troops who demand it, whether belonging to their own brigade or not. They will be organised in detachable sections, in order to facilitate reserves of ammunition being brought nearer to troops who are engaged on a broad front.

For the purpose of arriving approximately at the number of rounds of S.A.A. to be carried in ammunition columns, the number of rifles in units is calculated at 500 for Light Horse Regiments, and at 1,000 for Infantry Battalions ; other units are not considered.

(Instructions respecting Ammunition Columns are contained in Sect. 78 Field Artillery Training, 1908.)

The normal establishment of a Light Horse Regiment includes one Pom-pom Section and one Machine-Gun Section. One set of Machine-Gun pack saddlery (three pack saddles) is carried in the G.S. limbered wagon to enable the gun to be brought into action when the wagon can go no further.

Regiments equipped with two Machine-Guns will require two additional G.S. wagons limbered.

The normal establishment of an Infantry battalion includes a Machine-Gun Section (two guns). Bamboo poles are carried with the gun to enable them to be brought into action by hand when the wagons can go no further.

Battalions equipped with Maxim Machine Guns on carriages require one G.S. limbered wagon for ammunition and two additional horses.

As it is not at present intended to equip units with wagons for second line transport, but to utilise the wagons of the country, it is necessary to take the carrying capacity of some recognised vehicle as a standard, and for this purpose the General Service wagon in use in the Imperial Service has been selected. With a team of four horses, this wagon will carry a load of 2,700 lbs. with fast-moving units, or 3,000 lbs. with others; with six horses it will carry 40 boxes of S.A.A., or 108 rounds of 18-pr. ammunition.

In calculating the number of rifles required by units at War Establishment, the following is the scale:—

Light Horse, Engineers, Infantry, and Signallers—
- 1 per all ranks, except officers, bands, and drivers for train transport.

Field Artillery—
- 5 per Headquarters of a Field Artillery Brigade.
- 6 per gun in Heavy Batteries.
- 2 per ammunition wagon and limber, and 1 per gunner and driver (except drivers of ammunition wagons) in Ammunition Columns.

Garrison Artillery—
- 1 per all ranks, except Officers and W.O.'s.

Army Service Corps—
- 1 per all ranks, except Officers, Mounted W.O.'s, Mounted Sergeants, and Drivers.

(A) APPROXIMATE NUMBER OF ROUNDS PROVIDED IN THE FIELD PER GUN.

Description of Gun.	With Battery.	With Brigade Ammunition Column.	With Divisional Ammunition Column.	Total with Field Units.	With Ammunition Park.	Reserve on L. of C.	Total to be maintained in Field.
13-pr. Q.F.	176	220*	—	396	150	454	1,000
18-pr. Q.F.	176	76	126	378	150	472	1,000
4·5" Q.F. Howitzer	108	48	44	200	80	520	800
60-pr. B.L.	80	40†	60	180	70	250	500
6" B.L. Howitzer 100 lb. Shell	50	50	—	—	—	—	—
or							
122 lb. Shell	40	40	—	—	—	—	—

* 76 rounds in Ammunition Wagon and 144 rounds in G.S. Wagon. † Ammunition Column with the Battery.

(B) APPROXIMATE NUMBER OF ROUNDS PROVIDED IN THE FIELD FOR EACH MAN ARMED WITH THE RIFLE.

For each Rifle of	With Unit.		With Brigade Ammunition Column.	With Divisional Ammunition Column.	Total with Field Unit.	With Ammunition Park.	On Lines of Communication.	Tota to be maintained in the Field
	On the Soldier.	With Regimental Reserve.						
Cavalry & Light Horse	100	100	100	—	300	100	100	500
Divisional Cavalry ..	100	100	50	50	300	100	100	500
Artillery	50	—	—	—	50	—	—	50
Engineers	50	50	—	—	100	—	—	100
Infantry	120	100	80	50	350	100	100	550
A.S.C.	20	—	—	—	20	—	—	20
A.O.C.	20	—	—	—	20	—	—	20

(C) APPROXIMATE NUMBER OF ROUNDS ·303 INCH PROVIDED IN THE FIELD FOR EACH MACHINE GUN.

For each Machine Gun of	With Unit.		With Brigade Ammunition Column.	With Divisional Ammunition Column.	Total with Field Unit.	With Ammunition Park.	On Lines of Communication.	Total to be maintained in the Field.
	Service Ammunition.	Regimental Reserve.						
Cavalry ..	3,500	16,000	10,000	—	29,500	6,000	14,000	49,500
Infantry ..	3,500	8,000	5,000	5,000	21,500	6,000	14.000	41,500

For each Pistol 36 rounds are carried (12 on man, 12 in Regimental Transport, and 12 in Brigade Ammunition Column).

JUDGING DISTANCE.

By Day.

Necessity for Practice.

To a soldier the importance of being able to estimate approximately the distance of an object in the field is great enough. But to an officer or non-commissioned officer it is more—it is an essential part of his duty, since it devolves on him to give directions as to the sighting elevation to be used at distances beyond 600 yards, and difficulty in judging distances increases with the range. The only method of acquiring this knowledge is by constant practice in time of peace.

Methods of Self-education.

The methods of self-education recommended are :—

(1) Estimation of distances traversed in different kinds of country ; if walking, the calculation being checked by pacing ; if mounted, by the time occupied or the number of bumps in the saddle.

(2) Study of the size of men, horses, and common objects at known ranges, first with the naked eye, then with the field glass.

(3) Familiarity with the range of all objects within sight from some point constantly passed during the day, so that comparison of other ranges with these known ranges may gradually lead to proficiency in judging distances without any guidance for the eye.

METHODS OF JUDGING DISTANCES IN THE FIELD.

Besides range-finding instruments and maps, there are two ways of judging distances in the field, the first based on more or less accurate data, and applying to objects at a short or medium distance ; the second—on estimation only—to objects at a distance to which the first cannot be applied or where it is not possible.

I.—*Judging Short and Medium Distances.*

If he has not already a satisfactory method of estimating ranges in the field, each officer or non-commissioned officer should adopt one of the following methods :—

(1) *Observation of Object through Rifle Barrel.*

To ascertain the range within 900 yards of a mounted man—of average height and on a troop horse of average size—look through the rifle, having first removed the bolt, with the eye placed immediately above the butt-plate.

If the portion of the horse from his withers to his feet occupies more than the diameter of the rifle, the horse is less than 210 yards away.

If the man and horse occupy the length of the diameter exactly, the distance is 350 yards.

If the man and horse occupy one-half the diameter, the distance is 650 yards.

If the man and horse occupy one-third of the diameter, the distance is 850 to 900 yards ; but unless the light is very good it is difficult to see clearly a mounted man through the barrel when over 650 yards.

To ascertain the distance of any man standing up within 800 yards, look through the barrel, and,

If he occupies more than the diameter, he is less than 300 yards away.

If he occupies exactly the diameter, he is 300 yards away.

If he occupies one-half of the diameter he is not less than 550 yards away.

If he occupies one-third of the diameter, he is not less than 800 yards away ; but unless the light is good it is difficult to see a dismounted man through the barrel when he is more than 550 yards away.

DIAGRAM 10.

FIG. 1

MAN STANDING

AT 100 YDS. HE OCCUPIES SPACE BETWEEN 0 & 100
AT 200 YDS. " " " " 0 & 200
AT 300 YDS. " " " " 0 & 300
AT 400 YDS " " " " 0 & 400

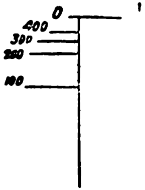
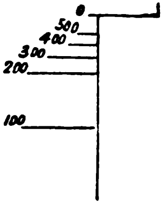

0
400
300
200
100

FIG. 2

MAN MOUNTED

AT 100 YDS. HE OCCUPIES SPACE BETWEEN 0 & 100
AT 200 YDS. " " " " 0 & 200
AT 300 YDS. " " " " 0 & 300
AT 400 YDS. " " " " 0 & 400
AT 500 YDS. " " " " 0 & 500


0
500
400
300
200
100

(2) *Measurement of Visual Angle by means of Measured Spaces on Card.*

To ascertain the distance of a man standing up within 400 yards, mark a card or pencil, as shown in Fig. 1, Diagram 10, p. 333. Hold it at arm's length, and he will be found to occupy at the respective distances the spaces shown on that Diagram.

To ascertain the distance of a mounted man within 500 yards, mark a card or pencil, as shown in Fig. 2, Diagram 10. Hold it at arm's length, and move the card until the extremities of man and horse touch two adjoining lines.

(3) *Aerial Perspective Method.*

Men may be taught to judge by the appearance of the target.

Particular attention should be paid to the head and shoulders of a man, as this is the usual service target at short ranges.

When the light is good:

At 50 yards the mouth and eyes of the enemy can be clearly seen.
At 100 yards the eyes appear as points.
At 200 yards the buttons and various parts of the uniform can be seen.
At 300 yards the face can be seen.
At 400 yards the shoulders are square.
At 500 yards the shoulders appear to be shaped like a bottle.
At 600 yards the head appears as a distinct dot like a cricket ball.
At 700 yards it is rarely possible to distinguish the head but the upper part of the body assumes a V-shape.
At 800 yards a man looks like a post.

Owing to differences in power of vision it is desirable that each individual should compile a table of visibility for himself.

(4) *Unit of Measure.*

This is a very useful method in open country at short ranges.

Men should be trained to recognise a unit, say 100 yards, and then apply this when in a prone position.

(5) *Rule of Thumb.*

Hold the hand at arm's length with the thumb pointing upwards. Close left eye and align left edge of thumb on object. Keep hand steady and close right eye and open left. The thumb will appear to have moved to the left. Estimate the distance moved in yards and multiply by 10, and the result will be the range in yards.

II.—*Methods of estimating Longer Distances.*

There are no absolutely satisfactory methods short of a range-finder for judging longer distances than those named above; but the following methods may be found of some assistance:—

(1) *Estimation of Half-way Distance and Doubling.*

Take a point estimated to be at half the distance to the object, calculate the distance of this half-way point by mentally apportioning off successive spaces of 100 yards each, and double the total.

(2) *Comparison with Easier Ranges.*

Estimate the distance by comparing it with the range of an object which can be more easily estimated, either because it is more easily seen, or because its size is known.

(3) *Averaging between Farthest and Nearest.*

Estimate the farthest and the nearest distance which is regarded as possible, and take the mean.

(4) *French Method.*

In the French Army men are taught to judge the longer distances in the following way :—

A clear-sighted man can see a church steeple up to about 9 miles ; windmills, towers, and big houses up to about 6 miles ; chimneys and windows up to about 2½ miles ; the trunks of large trees up to about one mile ; telegraph posts at about a quarter of a mile.

At 1500 yards infantry appear as a black line, cavalry as a black line rather irregular on the upper edge.

At 1200 yards one can begin to distinguish the files of infantry, whether cavalry are mounted or dismounted, and guns can be distinguished from the teams.

(5) *By Sound.*

Sound of discharge overtakes a round-nosed bullet at 1500 yards, a pointed one at 2000 yards. If the whistle of the bullet and the sound of the discharge are heard at the same time, the enemy is either at 1500 to 2000 yards according to the bullet which he is using. If the discharge is heard first, the distance is beyond that range.

(6) *By Flash and Sound.*

If the flash of a field gun can be seen, or at night that of a rifle, the range may be approximately ascertained by beginning to count, at the rate of 11 beats in 3 seconds, directly the flash is seen and ending immediately the report is heard. The number reached will give the range in hundreds of yards. Thus if 14 is reached, the range may be taken as approximately 1400 yards. The system is sound, but the difficulty lies in counting at the correct pace. It must be practised.

GENERAL RULES IN ESTIMATING DISTANCES.

When estimating distances the following general rules should always be borne in mind :—

When Objects appear Nearer.

Objects will appear to be nearer than they really are under the following conditions :—

(1) When the light is very bright and when the sun is behind one.
(2) When in the clear air of mountainous localities, whether actually on mountains or on a high plateau.
(3) When looking across water, snow, or level ground, or a nullah.
(4) When the colour or shade of the object differs from that of its background.
(5) When looking either upwards or downwards.
(6) When the object is large.

When the Objects appear Further.

Objects appear to be further off than they really are :—

(1) When the object is in the shade.
(2) When the light is failing or if it is misty.
(3) When looking over a valley or across undulating ground.
(4) When the object and its background are of a similar colour.
(5) When only a portion of the object is seen.
(6) When one is kneeling or lying down.
(7) When the object is located in an avenue or long street.
(8) When vapour rises from the ground over which one is looking.

General Principles.

When from any cause an object is distinct one is liable to under-estimate ; when indistinct to over-estimate.

Distances are generally under-estimated in war.

JUDGING DISTANCE LATERALLY.

To judge distance laterally, *e.g.* the length of a position at right angles to the line of sight, first ascertain or judge the distance to the object, then hold out the hand to the full extent of the arm. The lateral distance can be ascertained by the number of fingers which are required to cover the object the length of which it is desired to estimate.

100 yards is covered at 500 yards by 6–7 fingers.
,, ,, ,, 1000 ,, ,, 3–3½ ,,
,, ,, ,, 1500 ,, ,, 2 ,,
,, ,, ,, 2000 ,, ,, 1 thumb.

Judging Distance at Night.

While no very definite rules can be laid down for judging distances at night, the following observations may be of some assistance to those who have not formed their own theories.

OBJECTS WHICH APPEAR NEARER.

Objects other than Lights.

In estimating distances at night the following objects appear nearer than they really are :—

(1) Hills and woods lying close at hand, and the foot of hills and the lower parts of woods situated at a distance, in any cases where objects on the hill-sides cannot be seen or where the separate trees in the wood cannot be clearly distinguished ;
(2) Any object standing well out against the sky-line ;
(3) Smoke curling up against a clear sky ;
(4) Any light-coloured object, such as a house painted a light colour, a corn field, or a light stone in the midst of dark surroundings ;

And on a bright night :—

(5) A light green field.

Lights.

Lights, practically of all kinds, including diffused lights, such as those seen through a window-blind, and reflected light, such as that cast on trees from a fire which cannot itself be seen, appear nearer than they really are. The brighter the light and the more concentrated its rays, as, for instance, the rays from a lighthouse or powerful signalling lamp, the greater the tendency to under-estimate the distance.

Coloured lights are not so likely to be under-estimated as white lights.

Method of estimating Distance of a Light.

In estimating the distance of white lights :—

When the object which holds or carries a light, or in which the light is situated, can be clearly seen, the distance should be estimated—first, by estimating the distance to the light itself; and, secondly, after holding up a hand between the light and the eyes, by estimating that of the object which holds the light. The mean between the two should then be taken.

When the light cannot be exactly located and when the object which holds the light cannot be seen—though the ground or any natural features near that position can be seen—the distance to the light should first be estimated, and, secondly, after holding up a hand between the light and the eyes, to the ground or natural feature. The mean between the two should then be taken.

OBJECTS WHICH APPEAR FURTHER.

The following objects appear further off than they really are :—

The *tops* of hills or woods which are not situated very close to the observer and which are over, say, 500 yards away.

Use of Field Glasses at Night.

On a clear night ordinary Field glasses, or on a very clear night a telescope, is of assistance in enabling the observer to define the objects with a little more accuracy than can be attained with the unassisted eye. This is particularly so in the case of objects thrown into prominence by a light.

On a dark night, glasses or telescopes are of very little use.

PERSONAL NOTES ON JUDGING DISTANCE.

PART VIII.

CYCLIST OPERATIONS.

TERRAIN SUITABLE FOR EMPLOYMENT.

The countries in which cyclists will prove most valuable are, of course, those where roads, lanes, and footpaths are plentiful, such as England, France, Germany, and most of the other countries, at all events, of Western Europe; but in countries where roads are scarce, or non-existent, trained military cyclists should still be able to maintain a great mobility, provided that the ground has a moderately even surface and vegetation is not rampant. The African deserts and veldt, the American prairies, English meadow, parklands, and commons, Continental pine-forests, and the steppes of Russia are all practicable to cyclists. In countries also, such as India and Egypt, where the cultivated lands are intersected by tracks of sun-baked mud, cyclists are able to move freely.

Provided that there is a track of 4 to 6 inches wide, hardened either by traffic or the action of the sun, the actual condition of the road need not be considered.

In an enclosed country, such as England, it must be remembered that hedges, walls, fences, stiles, or other similar obstacles merely delay and do not prevent the progress of the well-trained cyclist. It is only in jungle, marshland, soft sand, and rocky mountainous country devoid of tracks that the cyclist is unable to make any use of his cycle, and is only impeded by it.

Snow, so long as it is not deeper than five inches, does not very greatly reduce the speed of the cyclist.

Experiments have shown that a cycle when wheeled over fairly level ground is an assistance rather than an impediment to the soldier on foot.

STRATEGICAL USES OF TRAINED CYCLISTS.

1.—*Coast Defence.*

One of the most important duties of cyclists in home defence is the watching of undefended harbours, and the stretches of coast which are not included in any definite system of coast defence, and points where landings are possible. Owing to their mobility cyclists are particularly suited to this work, and also for harassing and delaying the enemy if he has once landed.

In order that they may render themselves efficient for coast defence, cyclists in each locality must acquire an intimate knowledge of the coast in the vicinity of every possible landing-place. They should devote their attention particularly to the roads or tracks by which advance or retreat would be possible, and to the local means of communication, whether by way of telegraph or telephone.

They must make themselves acquainted with the various types of shipping and accustom themselves to working in conjunction with or in place of the coastguards.

2.—*To Raid Communications.*

Cyclists form a very suitable force for raids, since they are capable of carrying from 200 to 300 rounds of ammunition per man, and by their speed are able to avoid serious conflict. The range of action of a cyclist raiding force, except in a country strongly held by the enemy, is practically only limited by the food-producing capacity of the country through which it moves, and by the existence of roads and paths. Raiding forces should, so far as possible, march light, leaving all transport behind. Only one or at most two days' rations should be carried for use in the country actually overrun by the enemy. The remainder of the rations should be obtained from the country.

3.—*Against small Isolated Columns.*

Trained cyclists, in small or large bodies, might with advantage be used to affect the *morale* of an enemy by harassing his outposts at night and his advanced and flank guards by day, and so discourage him from moving in small columns.

4.—*To keep in touch with Friendly Population.*

Bodies of trained cyclists should also prove invaluable for keeping in touch and in friendly relations with a population who are temporarily subdued by the enemy.

5.—*To Police Invaded Country.*

Conversely, small cyclist columns could be advantageously employed to police and keep in subjection the population of an invaded country.

TACTICAL USES OF TRAINED CYCLISTS.

With Cavalry.

When operating with cavalry, cyclists may be employed either alone or in conjunction with that arm for any of the following purposes :—

(*a*) During the reconnoitring stage ; for the strategical or tactical reconnoitring patrols (see pp. 68, 70, 72, 74).

(*b*) During an advance ; for the advance guard, and for tactical reconnoitring, thus reducing to a minimum the number of squadrons or troops employed at a distance from the main body, and maintaining the maximum strength of the striking force at the moment of impact (see pp. 152–156). As supports for a screen of protective cavalry; to secure concealment of a march by picketing every village, thus preventing inhabitants from carrying information; to mislead the enemy by preventing hostile patrols from ascertaining the cavalry's exact line of advance; and to make demonstrations.

(*c*) In wide flanking movements.

(*d*) During the pursuit; for seizing positions on the enemy's line of retreat.

With Artillery.

Except possibly for a forced march or with horse artillery cyclists do not form a suitable escort for guns during a march, but as soon as guns are in position they may be detailed as their escort. They may possibly also be employed in reconnoitring and in locating the gun positions of the enemy.

With Infantry.

When acting in conjunction with infantry, cyclists may be best employed with the advanced, flank or rear guards. When this is the case, their duties will be much the same as those of divisional cavalry (see p. 151). They can be used also to secure positions of importance such as hills, bridges, or defiles, before the arrival of the infantry.

Under no circumstances should the cyclists be ordered to dismount and march with the infantry wheeling their machines beside them. An hour or two of this will render the men totally unfit for cycling during the remainder of the day. Consequently, if no definite work can be assigned to them, it will be best that they should march at the head of the main body or of the main guard of the advanced guard, ride forward a certain distance, halt and rest until the column comes up in rear of them, and then move forward again. In action, cyclists may perhaps be most usefully employed in watching the flanks or endeavouring to effect some wide turning movement.

With R.E.'s.

Cyclists may prove of great assistance to Engineers as an escort and a covering party, either in advance or in retreat, and also for carrying explosives and tools. It is now contemplated that a large proportion of officers and N.C.O.'s of cyclist battalions should have a practical knowledge of carrying out hasty demolitions without the assistance of R.E.'s.

In Reconnaissance.

Apart perhaps from despatch riding and maintaining communication, reconnaissance is the service for which well trained cyclists are best fitted, and in which they are, when the ground is suited to them, unsurpassed even by cavalry. They are, as has already been stated, well suited for strategical or tactical reconnoitring patrols, either alone or in conjunction with men of the mounted arm.

To come to details, when reconnoitring, cyclists, if dismounted, should invariably turn their cycles in the direction in which they will have to retreat, because the two or three seconds saved by this means may prove of vital importance in critical moments. They should always ride in single file, taking every advantage of cover offered by any turns in the road or path. The cyclist scout should seldom, if ever, separate himself from his machine unless it be to climb a tree or tower, or unless he is compelled to do so in order to fight.

Protective Duties.

(*a*) *With an Advanced Guard.*

Owing to its mobility it is seldom necessary for a cyclist advanced guard to a force of cyclists to be greater in proportion than one-eighth of the covered force.

For advanced guard of a mixed or infantry column, see p. 10.

For advanced guard of independent or protective cavalry, see pp. 152–157.

(*b*) *As a Flank Guard.*

The action of a cyclist flank guard when operating with infantry or mixed columns must, of course, depend on circumstances. They may, for instance, have to hold a position until the main body has passed and then fight a delaying action in conjunction with the rear guard; but if not called on to do this, it will often be found best, as the main column advances, gradually to move forward, not in a body but by consecutive companies, each body, when it moves, passing the bodies in front of it and taking up a position well in advance. Motor cyclists should keep the flank guard informed of the progress of the main body.

(*c*) *With Outposts.*

With outposts, cyclists are perhaps best employed for long distance reconnaissance and for standing patrols, but where the communications are convenient, their mobility renders them particularly suitable to act as supports or with the reserve.

If standing cyclist patrols are posted at a distance of some miles from a camp or bivouac, the number of troops employed on outpost duty may be largely reduced, since ample warning would be given of any advance by the enemy, at all events along the roads.

ATTACK AND DEFENCE.

In Attack.

Cyclists will always leave their cycles when a point is reached where the hostile fire obliges them to adopt very short rushes as a means of advance.

In the earlier stages of the attack, speed of advance affords greater chances of safety than even the most careful use of cover which necessitates delay. Consequently it may often be advantageous for cyclists, even over broken ground, to advance mounted. Short rushes of from two to three hundred yards can be easily accomplished in thirty seconds or so, men carrying their rifles in their hands, and this will not tire the men half so much as advances on foot. A rapid means of progression also will diminish the temptation to open fire prematurely.

In Defence.

When defending a position cyclists should ground their cycles at a short distance in rear of the defending line, and at some point from which retreat can be effected mounted. It must be borne in mind that two minutes' riding will take cyclists out of effective rifle range, even in open country.

Reconnaissance in Force.

Bodies of trained cyclists may prove valuable in carrying out a reconnaissance in force, as the rapidity of their movements may compel the enemy to disclose his main positions in order to save his covering forces from being cut off and surrounded. Their great mobility will enable the cyclists to venture further than other troops and still be able to extricate themselves in time.

Night Operations.

Cyclists are well suited for carrying out operations by night so long as they can move by roads or good paths. Their silent movement, the fact that there are no horses to betray their presence or to become panic stricken, and that each man, though trained to ride without it, is provided with a lamp which can be lit if required, all tell in their favour.

When cyclists engaged in night operations find it necessary to dismount and leave their cycles, these should be stacked in pairs, and in line of sections—while if it is thought safe the lamps of the right and left or front and rear cycles of each section should be lit. This will enable the men to find their own cycles quickly in case of a hasty retreat becoming necessary. If many sections are engaged, one man should be left with the cycles of each section in order to allow the cycles of the respective sections to be more readily identified when the men return.

Night Marches. (See p. 354).

DESPATCH RIDING AND INTERCOMMUNICATION.

Despatch Riding.

Cyclists and motor cyclists will be found invaluable for carrying despatches both for short and long distances, for keeping up communication laterally and from front to rear, and also for keeping touch with the transport as well as acting as orderlies with both cavalry and infantry. Good cyclists, riding without marching-order kits, will be found capable of averaging under favourable conditions, and with good roads, thirteen miles an hour on long distances, say, up to sixty miles, and about fifteen miles in hour for any distance up to thirty miles. Motor cyclists will average about double this speed. But in South Africa, even when the roads were good, ten miles an hour was found to be a good average for ordinary cyclists to maintain.

In cases where important and urgent messages are sent, it will be found advisable to send both a motor and an ordinary cyclist in case the motor breaks down. The motor can tow the other without reducing his speed to a very material extent, except when the roads are greasy. In that case the two men should ride separately.

Despatch riders, if their duties are likely to be arduous, should be allowed to leave all arms and kit on the regimental transport, and merely to wear belt, haversack, water-bottle, cape, and carry a revolver.

TABLE SHOWING PERSONNEL AND BICYCLES PROVIDED IN WAR FOR INTERCOMMUNICATION PURPOSES WITH UNITS OTHER THAN ARMY SIGNAL UNITS.

Unit.	Personnel.	Bicycles.‖
Headquarters cavalry divisional artillery	7 rank and file*	3
Headquarters divisional artillery . . .	7 ,, *	2
Headquarters divisional engineers . . .	. .	1
Cavalry regiment	1 officer 1 sergt. 14 rank and file† 27 ,, ††	15
A squadron of Irish Horse	6 ,, ¶	
Horse artillery brigade—		
Headquarters	9 ,, ‡§	3
Battery	7 ,, ‡	3
Ammunition column	3 ,, ††	3
Horse artillery battery	9 ,, ‡	3
Cavalry Ammunition column	3 ,, ††	1
Field artillery brigade—		
Headquarters	12 ,, ‡§	1
Battery	7 ,, ‡	1
Ammunition column	5 ,, †	1
Field artillery (howitzer) brigade—		
Headquarters	12 ,, ‡§	1
Battery	7 ,, ‡	1
Ammunition column	3 ,, †	1
Heavy artillery battery	8 ,, ‡§	1
Divisional ammunition column	6 ,, †	6
Field troop	3 ,, †	. .
Field company	3 ,, †	1
Bridging train	. .	1

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* Includes 4 trained signallers.
† Trained signallers.
†† Trained in Semaphore Signalling.
‡ Trained in signalling and telephonist's duties.
§ Does not include driver for telephone wagons.
‖ Provided for despatch riding and use of signallers as required.
¶ Despatch riders.

Unit.	Personnel.	Bicycles.‡
Infantry battalion	1 officer 1 sergeant 16 rank and file* 36 " ††	9
Divisional train	..	2†
Army troops train	..	2†
Cavalry field ambulance	4 rank and file††	2
Field ambulance	6 " ††	1

* Trained signallers.
† For requisitioning duties and intercommunication.
†† Trained in Semaphore Signalling.
‡ Provided for despatch riding and use of signallers as required.

MARCHES.

General Directions.

Formation.

Cyclists in formed bodies should march in column of files, that is to say, two men abreast. Squad commanders should ride on the right of, and in line with, the rear file of their respective squads ; section commanders with the leading file of their sections. Captains commanding companies should ride at the head of their companies, and subalterns in rear.

Road Spaces.

An average distance of one yard should be maintained between files, four between sections, and ten between companies, and if a column is composed of two or more regiments, one hundred yards between each regiment.

Cyclists occupy a greater road space from front to rear than any other troops, namely, two yards approximately of road space for each man in the ranks in single file. The object of all instruction in marching should be to counteract the tendency to increase this more than is absolutely necessary, although free wheels and the gradients of the road militate against a fixed and constant distance being maintained between files and between units. After traversing hilly ground, the average distances should be regained as quickly as possible.

The following is a table of the average road spaces occupied by cyclist bodies of different strengths :—

Cycles	2 cycle lengths		Including all supernumeraries but exclusive of transport and motor cycles.
Squads	9 yards		
Sections	18 ,,		
Company	90 ,,		
Battalion	800 ,,	including Machine-gun Section,	

If a leading unit increases its pace in descending a hill, the unit following should throw out connecting files. Men should always be detailed for this purpose and do so automatically.

As to road spaces occupied by a French and German cyclist company respectively, see *post*, p. 355.

Mounting.

Men must be taught to mount and dismount quickly, otherwise spaces are not kept, and time is lost on the road.

Since cyclists are to a certain extent obliged to mount in succession, the head of a column when marching off should invariably move at a very reduced pace until the rearmost files have mounted. No body of cyclists can be considered as trained until every individual man can mount without halting or wobbling.

Forming Single File and Re-forming Files.

When it becomes necessary on account of obstacles to form single file the men who have passed the obstacles should increase their pace, but when they are re-forming files those who have done so should march slowly until the rearmost file is re-formed.

The greater the number of men the greater will be the necessity of observing these rules.

Route Marching.

1. *Schedule.*

When not in the immediate presence of the enemy a schedule should be made before starting, and adhered to in practice as closely as possible. In preparing the schedule the wind, weather, surface, hills, and traffic, should be taken into consideration, and an allowance of five minutes in every hour should be made for a halt, with an additional half hour every four hours if a long march is to be undertaken.

2. *Inspection of Cycles.*

The section commander is responsible for seeing that the cycles of his section are in good order. The condition of tyres and spokes, the brakes, saddle, steering gear, lamp and pump, must be inspected. The rifle must be secure in its attachment, and the tool bag must contain wrench, screwdriver, can filled with oil, repair outfit, cleaning cloth, spanner, and tyre remover.

3. *The Start.*

The first few miles of a march should invariably be made at a pace less than the average pace which is to be maintained throughout, or at any rate until the whole column has started. The pace should then be gradually increased until the desired average is attained.

4. *March Discipline.*

The men should whenever possible be allowed to march at ease, but rigid attention must invariably be paid to the maintenance of distances.

5. *Casualties.*

Men obliged to fall out from the ranks to mend a puncture or to make an adjustment must report to their section commander, and also to the O.C. rear guard. In cases entailing lengthy repairs the O.C. rear guard should detail a motor-cyclist mechanic to assist the man and subsequently to tow him back to the column.

Changing the Order of March.

The nearer men are to the head of a column the less will they feel the fatigue of marching. The order of the column should therefore be changed about every two hours, whilst the order of sections in each company can with advantage be changed at more frequent intervals. This can be easily effected on the march. The company commander, having previously warned the rear section, will blow his whistle, and the rear section will then incline to the right and increase the pace; the remaining sections slightly decreasing the pace until the change is completed.

Marching up a Hill.

When a column has to dismount to walk up a hill, the men should be dismounted at the bottom—not halfway up—and the leading files should not remount until the rear files have reached the crest.

It is best to climb long easy gradients at a slow even pace, though very short steep gradients may be " rushed." On steep gradients, however, of over fifty yards in length it is best to dismount, especially if the day's march is likely to prove a long one.

Halts.

It is laid down that there should be a halt of fifteen minutes to overhaul cycles forty-five minutes after the head of the column has moved off. Every subsequent hour it will be found advisable to make a halt of five minutes, and every four hours one of half an hour. If halts are made for longer periods, the men tend to become stiff rather than rested. The columns should be ordered to halt at certain points selected beforehand, where cross roads are favourable for communication. At all halts, sections or companies close up on the unit in front of them ; the proper distance is then regained when the column moves. Halts should be made when the whole of the troops are at the top of a hill—never half-way up or at the bottom.

During halts cyclists must keep to the left of the road.

Marching through Towns.

When in peace time a large column has to march through a town, it will be found advisable to send on a detachment under an experienced officer, to assist the police in clearing a free passage and controlling the traffic at cross roads, etc.

Signs of Fatigue.

When smoking and conversation cease, it is a sure sign that the men are tired and that a short halt would be advisable. This will often be noticeable in the rear of a column, though possibly not at the head.

Night Marches.

Advanced Guard.

The advanced guard—which may be numerically weak—should consist of specially selected men, and should precede the main body at a distance of not less than two miles. In addition to the ordinary duties of an advanced guard, on a night march they should look out for the road being strewn with materials which may cause punctures.

Main Body.

No lamps should be lit unless the night is exceptionally black and overcast ; but in that case the leading file of each section may light their lamps. If the night is very dark it will be well to make the men in each file ride with their hands on one another's shoulders.

Rear Guard.

If the troops engaged in a night march exceed one Company a medical officer should be attached to the rear guard, which should consist of proficient repairers and cyclists. If the night is very dark and the march a hard one, it will frequently happen that before daybreak the rear guard will have fallen some miles in rear of the main body. The O.C. column should bear this possibility in mind and issue instructions accordingly.

Rates of March.

The following table of rates of march will be found useful in making out schedules and in considering strategical and tactical operations.

	1 mile.	10 miles.	40 miles.	100 miles.	Limit in 24 hours.
Chosen individual riders	3 min. 4 min.	30 min. 40 min.	2 h. 20 m. 3 hours.	6 hours. 9 hours.	About 200 miles.
A patrol (7 men)	3½ min. 4½ min.	40 min. 50 min.	3 h. 15 m. 4 hours.	10 hours. 12 hours.	About 100 miles.
A company (60 men) . . .	4 min. 5 min.	48 min. 58 min.	4¼ hours. 4¾ hours.	12 hours. 16 hours.	About 100 miles.
A battalion (525 men) .	8½ min. 12 min.	60 min. 70 min.	4½ hours. 5½ hours.	14 hours. 20 hours.	About 80 miles.
Motor cyclist .	1¾ min. 2¼ min.	17 min. 24 min.	1 h. 15 m. 1 h. 50 m.	3½ hours. 4¾ hours.	

The figures above the line in each case indicate what can be done on a forced march, while those below the line show the time which should be allowed when preparing a time schedule for a march under ordinary circumstances; but see the next paragraph. In all cases the time is given from start to finish and includes all necessary halts for rest and food.

German Cyclist Company (in single file) 100 men travel at average rate of 9 miles per hour and cover 500 yards.

French Cyclist Company (3 abreast) 220 men at rate of 10 miles per hour cover 400 yards.

Conditions affecting Rate of March.

The following are the conditions which affect the rate of march :—

1. A strong following wind will add about one-fifth to the marching capacity and immeasurably to the morale and endurance ;
2. A side wind will hardly affect progress ;
3. A headwind will reduce speed about one-third or one-half;
4. Roads heavy in mud and water will reduce speed by one-fifth ;
5. A dark night with no lamps lit will reduce speed by one-third ;
6. A dark night, lamps allowed, reduces speed one-fifth ;
7. If no paths exist, progress over grass, meadow, park, and heath land will be about one-third to one-half of that set forth in the schedule ;
8. Motor cycles can be expected to do 25 miles an hour by day and 15 by night. If the roads are greasy or very tortuous, or the night very dark, the rate of motor cyclists may be reduced by one-fourth.
9. Where the roads are very dusty, the road space occupied by the column will be greatly increased, though the rate will not be materially lessened.

Methods of carrying Equipment.

(*a*) *Rifle.*

The War Office have decided, after considerable experience, that the rifle shall be carried with the butt resting in a bracket fixed to the rear fork of the cycle and the fore end held firmly by a steel clip just above the front fork.

(*b*) *Ammunition.*

Bandoliers are not suitable for cyclists, and spare ammunition should not be carried on the cycle. The universal service pattern of equipment, the Nules-Webb is as suitable for cyclists as infantry.

(*c*) *Repair Outfit and Tools.*

The back pouch should also have a second compartment to hold the adjustable spanner, oil can, and tyre repair outfit, which every man must carry. A tyre remover will also be found very useful.

(*d*) *Cycle Accessories.*

Each cycle must be fitted with a strong brake, or, if a free wheel cycle, two brakes, a lamp carried on a bracket on the right side of the front forks, and a pump clipped to the upright tube. Scouts and section commanders should also have cyclometers.

(*e*) *Mackintosh Capes.*

Mackintosh capes provided with wrist straps, as well as straps to go under armpits should be carried. When not in use, these should be rolled and fastened to the handle bars either by two straps, or by a cape-clip. The latter is preferable since it can be used in addition as a map-holder, thus enabling men to have the map always in front of them.

(*f*) *Valises.*

A waterproof leather valise should be carried on a front carrier. This should contain spare shirt, sweater, pair of stockings, and cleaning utensils.

(*g*) *Great Coats and Blankets.*

The officer commanding will decide which of these should be carried in the rear carrier and which in the regimental transport. The blanket, if carried, should be rolled in a light waterproof sheet, should be carried lengthwise on the rear carrier, which must be fitted so as to clear the butt of the rifle when attacked.

Identity Disks.

Identity disks should be fixed to every cycle; the H.Q. staff, the M.G. section, and the various companies having distinctive colours. In the case of the company, No. 1 will always be the captain, No. 2 the subaltern, and so on. Thus despatch carriers, etc., seeing a cycle, will be able to identify the rank and company of the owner.

Carrying of Flags.

It is laid down that the commanding officer's orderly should carry a small blue flag, attached upright to the handle-bars by clips, and that officers commanding companies should carry small white flags, and section commanders red flags.

Movements by Rail.

Rifles will be detached before entraining. Cycles should be packed parallel to the axles of the truck or wagon alternately handle-bars to saddle, and as upright as possible. In covered wagons sufficient space for a man to pass should be left between the cycles and the side of the wagon which will be next to the unloading platform. On arrival, the men will detrain first and fall in. Six men per company, or more if the company is at a distance from the platform, will be detailed to unload cycles, two being in the wagon to unload, the remaining four to wheel away the cycles. As these men approach the company, they will call out the cycle numbers, and hand the machines over in rotation.

Cycle-Drawn Machine Guns.

Method of Traction and Mounting.

Two machine guns, mounted on light carriages which are capable of traction by cyclists, form a valuable adjunct to a cyclist column.

The lightest gun for this purpose is the Colt gun, which, with mounting and carriage complete weighs 200 lbs. and stands 3 feet high. It can be lifted while still mounted, over a high wall by four men, and can be taken across any ground over which cyclists can pass.

The Maxim, mounted in a similar manner, weighs about

80 lbs. more than the Colt, and, besides reducing speed, this increases wear and tear on tyres.

The Colt gun can, on a flat road, be easily drawn by one man. But if the road is heavy or there is a head wind, it will be found advisable to attach an extra man. On arriving at a steep hill the spare men of the gun section can assist the gun team by placing hands on their shoulders. There is no advantage in attaching more than two men to a gun, because the "side-pull" which is incurred neutralises the additional assistance.

The trail of the gun should be attached to a hook behind the saddle of No. 2 of the team, who, in his turn, is connected with No. 1 by means of a bamboo or tough wooden rod, hooked on to his own machine in front of the handle-bars, and attached to a hook behind No. 1's saddle. A system of universal joints and small springs reduces to a minimum all jolts and side-action. The gun can be unlimbered or limbered up in about 5 seconds.

Machine guns so drawn can move at the same pace as the column, good teams being able to cover as much as 15 miles an hour on an average road. Only men who are *strong on the pedal* and who are at least 25 years old should be chosen for this duty, as the strain on up gradients is too much for men who are not fully developed. Racing cyclists, as a rule, are not so good for this duty as hard wiry men accustomed to riding on heavy roads. No special machines are required for this purpose, but they should be strong and preferably low built, with fixed gears of about 63 inches.

Machine-Gun Section.

A machine-gun section consists of 2 guns and 2 ammunition limbers. The limbers should be fitted with gun mountings so as to form spare gun carriages in the event of the ordinary gun carriages breaking down or being temporarily unavailable.

Six men are required to pull each limber or gun carriage, *i.e.* 3 teams of 2 men each, while a sergeant and a corporal should act as gun layers and generally supervise the movement of the guns. The section should be under the command of a subaltern. It will be found advantageous to attach two motor cycles to the section, for at the end of a long march they can render great assistance by helping to tow the gun. A motor cycle cannot replace a team altogether because it is too cumbersome for limbering and unlimbering, and also because its speed is too erratic, being too fast downhill, and too slow uphill, and on severe gradients probably having to be pushed.

Motor cycles can, however, be made use of when units are supplied with Maxim guns on tripod fittings, the gun and tripod being fastened to a special form of carrier on the motor cycle.

Experiments have recently been carried out with taxi-chassis and "auto-carrier" tricars fitted with gun platforms on which the guns and tripods are strapped when not in service. Taxi-chassis have been found to give too much "speed" (overheating when running on speed at columns), and the springs are liable to break. The auto-carrier will give 20 miles per hour loaded, is easier to turn in narrow roads and can run for many miles at 8 miles per hour without overheating unduly.

Cycles in Camp and Bivouac, Etc.

Under Canvas.

The best accommodation in peace time is afforded by the ordinary ridge-pole tent which can hold the 40 cycles of the complete section. If no props or cycle stands are available, the best method is to lean two cycles against each of the supporting poles, and then to range the other cycles alongside them. Bell tents will hold eight, or if necessary, ten cycles.

In the Open.

If no tents are available, cyclists on arrival in camp should be ordered to form quarter column, and to stack their cycles. The odd numbers should then spread their mackintosh capes over each pair of cycles. If this is carefully done, it will keep the rain off the greater portion of the framework. Each section leader should satisfy himself that his cycles are firmly stacked, and that there is no fear of any being blown down.

In Billets.

When cyclists are billeted in a village or town, and there are no buildings available for sheltering the cycles, the same system may be applied as in the open except that the cycles should be stacked on one, or, if the road be not too narrow, on both sides with their back wheels against the kerbstone or some other ledge.

In Buildings.

When buildings or outhouses are available, cycles should be propped against the walls in layers, and if space admits, the cycles of each section should be kept together.

It will be found that ordinary horse stalls will accommodate eight or if they are packed close, ten cycles each.

Motor Cycles.

A motor cycle for military purposes should combine the following points :—

1. Handle-bar control, with spring forks for the front wheel to operate on the handle-bars so as to ensure better steering when traversing rough roads.
2. Two-speed gear, not fixed gear with clutch.
3. A light machine is not strong enough for the rough usage it will experience.
4. Pedals are desirable.
5. Rubber 2½ inch tyres, not leather treaded, with a non-skid type on back wheel.
6. For long distance riding a machine of 3 horse-power appears to be about the limit. A speed of 30 to 40 miles can be attained on a fair road.
7. The engine should not be placed too low down in the

frame; a clearance of 7 to 9 inches should be allowed; but not higher owing to the danger of side-slips.

8. Large tanks on engine, say 3 gallons, to carry petrol.

Motor cycles, when not in use, should invariably be put on their stands.

Repairs and Renewals.

Punctures.

A puncture is of course the most common form of injury. Every cyclist should be able to repair a punctured tyre within ten minutes, and a "burst" in not more than fifteen or twenty minutes.

The efficiency of a cyclist unit for active service will to a great extent depend upon the state of the tyres. It therefore forms one of the most important parts of a subaltern officer's duty to see that all tyres are in a fair average condition. Those which are damaged should be repaired or exchanged before the march begins. Statistics show that tyres in good condition, not necessarily new, do not average more than one puncture in 210 miles in an average English country side. On flint roads or thorn-strewn paths, this proportion will of course be increased, whilst on main roads it will be decreased. The best tyres for military purposes are (*a*) Palmer Special, (*b*) Dunlop Tandem. Only the best tyres should be used by men whose lives may depend upon the endurance of their tyres. It is very false economy to spend money on a cheap tyre.

Small Repairs.

Small repairs, such as straightening a crank, repairing a chain, straightening a buckled wheel, etc., should be carried out as a rule by the man himself, assisted perhaps by one of the other men.

Serious Repairs.

When operating in England, cyclists will generally find that the quickest way to have a repair effected is to go to the nearest smithy or cycle-shop, and supervise the repair in person. In Wales, Scotland, or abroad, it is advisable to attach a mechanically propelled repair wagon to each cyclist regiment. This wagon should be fitted with duplicates and accessories of all kinds as well as a forge, and should be able to travel at ten miles an hour. Moving with the rear guard, this wagon should carry a staff of at least two good cycle mechanics.

The Military Cycle.

The too common mistake in choosing a cycle for military purposes is to err on the side of lightness or of overweight. Any well-known make of English roadster cycle is suitable for military purposes provided that the machine is equipped with 2 brakes, 2 speed or 3 speed gear, 26-inch wheels, strong rear carrier, rat-trap pedals.

Preferably the machine should be all black and expose no nickel parts.

Gears.

A military cyclist should ride the highest gear he is able to ride up any hill. If using a variable gear, his lowest gear should conform to this condition. To allow for the weight of rifle and kit, he should choose a gear ten inches lower than if he were choosing one for ordinary civilian purposes.

Free Wheels.

The use of free-wheels is to be discouraged. The fixed wheel gives better control of the machine at all times, and more uniform marching formations. It also permits of the accurate measurement of distances for scouting and map-making purposes.

A gear which combines both a free-wheel on the high speed and a fixed wheel on the low, is particularly suitable for military purposes, because the free-wheel can be used for speed, or for comfort on long route marches, whilst the fixed wheel can be brought into use whenever there is any possibility of encountering an enemy. "The Hub" two-speed gear is of this description, but is no longer to be obtained in the market unless specially ordered.

The Folding Cycle.

In Continental armies there is a mistaken belief that a cycle which can be folded and carried on the back is to be preferred to the ordinary rigid type. Practical tests and the consensus of expert opinion in this country is strongly against this view, the principal objections being that :—

(1) It is easier to push or lean on a cycle than to carry it on the back.
(2) It causes loss of time and the joints entail lack of rigidity.
(3) It means additional weight, besides decreasing strength.
(4) A man good enough to be a military cyclist can, except in a mountainous country, ride his machine anywhere that a man can walk.

Transport by Sea.

The most satisfactory way to deal with the transport of cycles by sea is to pack them on land in crates, and then lift the crate bodily by crane power into the hold of the ship. The crates should be made so as to take sufficient cycles for the smallest tactical unit, that is the patrol. By fixing the cycles in a slot or rack in the crate, they will not get damaged, and great economy will be saved in the storage capacity of the ship. This method ensures great rapidity in handling, the crates being easily slung. Whether these crates are on deck or in the hold, the sea air will undoubtedly rust the plated parts of the cycles, and therefore for long voyages a liberal coating of grease in a fairly liquid state, which will solidify as it dries, is necessary.

For a long voyage the cranks and pedals should be taken off the cycles, and the handles turned parallel to the machine so as to economise space as much as possible.

PART IX.

APPRECIATIONS AND ORDERS.

APPRECIATIONS.

" What is wanted is a military appreciation of the actual situation culminating in a statement of the measures recommended to meet it."

A written appreciation of a strategical or tactical situation should, as a rule, include a clear and concise statement of the following :—

1. (*a*) The position of our own forces and the strength of all arms available. Possible reinforcements.
   (*b*) The position of the enemy's forces so far as it is known and the strength of all arms available. Possible reinforcements.
2. The object we have in view.
3. The various factors which may effect the attainment of this object :—

   NOTE.—Only those factors which are relative to the situation need be discussed.

   (*a*) Vulnerable points of each force.
   (*b*) *Morale* of each force.
   (*c*) Character of the opposing force and particularly of the opposing General.
   (*d*) Apparent object of the enemy.
   (*e*) Safety of the Lines of Communication.
   (*f*) The provision of transport and supplies.
   (*g*) Nature of the country, roads, railways, and water.

- (*h*) Time available and the important points which can be reached by the opposing forces in a given time.
- (*i*) Weather.
- (*j*) Attitude of the inhabitants.
- (*k*) Influence of politics.

4. The courses open to us.
5. The courses open to the enemy.
6. A definite proposal for our action, giving :—
    - (*a*) The forces to be employed and their distribution and destination.
    - (*b*) Hours and routes of march.
    - (*c*) Methods of transport and supply.

In considering the best proposal to adopt always look at the situation from the enemy's point of view and bear the following points in mind :—

1. Consider first how to attain your own object, not merely how to prevent the enemy attaining his ; then consider what action of his will most interfere with your plans, and accordingly what counter measures are advisable.
2. A clue to the soundest manœuvres will often be obtained by considering the enemy's vulnerable points ;
3. The force which first seriously attacks its opponents' communications compels them to conform to its movements.
4. Concentration of superior force, moral and physical, at the decisive point is the grand rule of war. For this reason, though detached forces may be necessary for feints, etc., all detachments must be reduced to a minimum.
5. Surprise is the greatest of all weapons ; always endeavour therefore to mystify and mislead your foe ; omit no precaution to cover your own dispositions ;

6. Complicated operations are very dangerous;
7. More than one line of operations is as a rule dangerous.
8. Leave no weak spot unwatched.
9. The question of food and supply must always be carefully considered. The plan proposed may be sound strategically and tactically, but administrative difficulties may render its accomplishment impracticable.

ORDERS.

According to "Field Service Regulations," there are three kinds of orders:—

1. Standing Orders.
2. Routine Orders.
3. Operation Orders.

In the case of detached forces, special instructions may be issued instead of "Operation Orders." Special Orders, such as "Orders for the Day," may be required occasionally.

1. Standing Orders.

It is laid down that the object of Standing Orders is:—

(*a*) To adapt existing regulations to local conditions, and
(*b*) To save frequent repetitions in Operation and Routine Orders.

They deal with such matters as marches, duties, discipline, camps, medical, transport and remounts, veterinary, correspondence, supplies, general matters and communications. They are not dealt with here as they are not within the scope of this work.

Strict adherence should at all times be given to Standing Orders.

2. Routine Orders.

Routine Orders are of the same nature in war as in peace, and deal with such matters as administration, discipline, interior economy, etc., but not with the tactical operations. They are not within the scope of this work.

3. Operation Orders.

Operation Orders are orders issued to the various bodies of troops relating to the conduct of the strategical and tactical operations.

An operation order should contain just what the recipient requires to know and nothing more.

ISSUE OF OPERATION ORDERS.

Time of Issue.

As a rule Operation Orders should be issued daily at a fixed hour, and the earlier the better, seeing that it takes a considerable time for them to filter through to all the units.

At the hour named, officers of the various units concerned should be sent to headquarters to receive the orders. It is laid down that these officers must be prepared to give to the superior officer issuing the orders all information which he may require concerning their particular units, such as extent of casualties, supply of ammunition, provisions and other stores which are in hand.

If it is not possible to issue orders until a late hour, preliminary orders giving the time of start and place of assembly should be issued, and the hour when the full orders will be issued should be stated.

General Rules in Framing Orders.

The following is the outline of the rules laid down in "Field Service Regulations" for the framing of Orders :—

1. Clear writing is of the first importance.
2. The message must be as concise as possible and consistent with clearness.
3. In giving the time, a.m. or p.m. should always be stated. In case of 12, noon or midnight should be added. A

night should be described thus :—" Night 30th June/1st July."

4. Names of persons and places should be written in block capitals and units described by their Army List Abbreviations.
5. In naming units from which some portion is excluded, the unit should be named and the words " less . . . " added, for instance, " 1st Royals less one squadron," unless it is intended to exclude the headquarters of the regiment in which case it should be " 2 squadrons 1st Royals."
6. If a map is referred to in the orders, the one referred to must be specified. The position of places should be noted either by the points of the compass, *e.g.* " Wood 300 yards W. of . . . " or thus, " a point . . . close to O in C*O*BHAM," the letter being underlined. A road should be indicated thus, " ROCHESTER-GRAVESEND " Road.

Except in the case of the right and left banks of rivers, indefinite or ambiguous terms, such as right, left, before, behind, beyond, front, rear, on this side of, etc., must *not* be used. All bearings must be true bearings.

7. If the order refers to troops reaching a certain place at a given time, it is assumed that the head of the main body is meant unless otherwise stated.
8. The writer having finished his order, should read it through carefully and assure himself that it is clear and cannot be misread by the recipient.
9. Orders sent simultaneously to several units should have the fact noted on each copy which is sent.

Common Errors and Omissions in Writing Orders.

(*a*) Incorrect heading. That given in F.S.R., Part I., page 28, is to be followed. In the heading it will be observed that the date is in figures, and that a place, such as an hotel, is given as the locality from which the orders are issued. It is insufficient merely to mention a town or village.

(*b*) The use of the term "The head of" (*see* F.S.R., Part I., Sec. 9, 1, viii.) is unnecessary when speaking of the relation of the main body to the "starting point."

(*c*) Omission of method and hour of issue of orders, and persons to whom issued.

(*d*) Omission of name of commander of transport, &c.

(*e*) Omission of mention of a "starting point" (*see* F.S.R., Part I., Sec. 30).

(*f*) Composition and strength of advanced guards (*see* F.S.R., Part I., Sec. 66, 1, 2, 3), and vanguards (*see* Part I., Sec. 66, 3).

(*g*) The naming of an hour for the advanced guard to march (*see* F.S.R., Part I., Sec. 68, 1) by any authority other than its own Commander.

(*h*) Use of unnecessary words (*see* F.S.R., Part I., Sec. 9, 1, ii.).

(*i*) Neglect of F.S.R., Part I., Sec. 12, 8. Except when a commander is named, the words "(in order of march)" above the detail of troops are necessary.

(*j*) Omission to detail a field ambulance, or portion thereof, with fighting troops when an engagement is anticipated or imminent (*see* F.S.R., Part I., footnote to page 54). For normal position of field ambulances (*see* F.S.R., Part I., Sec. 27, 2).

Transmission of Orders.

Except in the case of orders which are issued verbally to a small force which is under the immediate direction of the officer issuing the orders, such as orders issued by a battalion commander to his company commanders, all orders will be either:

1. Given to representatives of the various units concerned or sent by despatch rider;

2. Signalled; or 3. Forwarded by telegraph or telephone.

In the case of orders either signalled or telegraphed, they should, if of an important nature, always be sent in cypher, but a message should never be sent partly in cypher and partly plain, while a duplicate of all important orders which are sent by a despatch rider should be sent by a second messenger and if necessary, by another route. A receipt should be obtained for all important orders.

All Signalled and Verbal Orders should invariably be confirmed in writing as soon as possible.

Endorsement of Orders.

A copy of all orders which are issued should be kept and should be endorsed for reference as follows:—

"Issued personally to representatives of X and Y Regiments at 3 p.m.," or

"Signalled to O.C. A and B Regiments at 3.15 p.m."

FORM OF OPERATION ORDERS.

Every order must be self-contained and not refer to superior orders. The following forms of Orders are in accordance with "Field Service Regulations" but cannot be taken as necessarily covering the multitudinous situations which may arise in the Field. The examples must only be taken as a general guide.

NOTE.—The heads of Orders are given throughout in ordinary type in the left hand column, while the examples are given in italics in the right hand column.

The following principles are laid down as being those which should guide the commander of a force and subordinate commanders in framing orders for an attack.

I. A definite objective or task should be assigned to each body of troops, the actual limits of frontage being specified as far as possible.

II. The direction of the attack to be made by each body of troops should be distinctly stated.

III. Most careful arrangements should be made to ensure that attacks intended to be simultaneous should be so in reality.

IV. The choice of the manner in which the task assigned to each body of troops is to be performed should be left to the commander of that body.

1. Orders for Day Attack.

HEADS OF ORDERS.	EXAMPLE.
(*a*) Class to which order belongs.	*Copy No.* 1.
(*b*) Numbers.	*Operation Order No.* 1.
(*c*) Name of officer issuing order.	*by*
(*d*) Force to which it refers.	*Col. X. O.C.* 1*st Column.*
(*e*) No. of copy, on right hand top corner.	
(*f*) Date and place of issue, on right-hand side.	*BRASTED,* 17*th June,* 1909.
(*g*) Maps referred to.	*Reference* ½" *Ord. Survey. No.* 287.
1. The general situation— (*a*) As regards one's own troops; (*b*) As regards the enemy. [NOTE.—*Source of information as to* (*b*) *should be stated, and if not, the degree of credibility which the officer issuing the order attaches to the information.*]	1. *The Xth Division is at WESTERHAM. Our Scouts report that the enemy, strength about* 3 *battalions infantry,* 1 *regiment cavalry and* 3 *batteries artillery, is in position on the hill* 1 *m. N.E. of OTFORD with his right resting on a point* ¾ *m. S.E. of SHOREHAM and his left on point* 714, ½ *m. N. of KEMSING.*
2. Intention of the officer issuing the orders.	2. *The column will attack the enemy in position.*
3. Orders to fighting troops— (*a*) Cavalry; (*b*) Artillery; (*c*) Infantry; (*d*) Engineers.	3. 1*st D.Gs.* (*a*) *One Sqdn.* 1*st D.Gs. will cover the flank of Col. A's. attack, marching at* 7 *a.m.* 1*st D.Gs. less* 1 *Sqdn. will*

HEADS OF ORDERS.		EXAMPLE.
		act against the enemy's R. flank. marching at 6.50 a.m.
		(b) The Artillery will march at 7.15 a.m. in rear of the 1st Bn. R. Scots, and will come into action S. of the SEVENOAKS-MAIDSTONE Rly. at suitable points to support the attack.
	1st Bn. R. Scots.	*(c) The 1st Bn. R. Scots will march at 7.10 a.m. and attack the enemy in front, on a frontage E. end of BEECHY LEES WOOD, to W. end of BEECHY LEES WOOD. They will keep in touch with the 1st Bn. The Queens.*
	1st Bn. *The Queens* *1st Bn.* *The Buffs* *O.C. Col. A.*	*The troops detailed in the margin will march at 7 a.m. and attack the enemy's left, on a frontage W. end of BEECHY LEES WOOD to Point 657.*
	1st Bn. R. Lancs. R.	*The 1st Bn. R. Lancs. R. will form the General Reserve and marching at 7.50 will form up at Cross roads at SEAL CHURCH at 9 a.m.*
		(d) The 1st Field Co. R.E. will march at 7.40 a.m. and repair the Ry. Line at a point 200^{x} *N. of BAT AND BALL STATION.*
4. Orders to— (*a*) Ammunition Columns	*Brig. Amn. Col.*	*4. (a) The Brig. Amn. Col. will march at 8 a.m. and form up at SEAL on the main road SEAL-RIVERHEAD. The empty S.A.A. carts will return to SEAL and refill.*
(*b*) Field Ambulance	*1st Field Amb.*	*(b) The O.C. 1st Field Ambulance will establish a dressing station at Pt. 288, ½ m. N.N.W. of SEAL. In moving to this he will follow the R. Lancs. R.*

HEADS OF ORDERS.		EXAMPLE.
(*c*) Second line transport.	*2nd line Transport.*	(*c*) *The second line transport and*
(*d*) T. and S. columns.	*T. and S. Col. under command of Major B.*	(*d*) *T. and S. column will march at 9 a.m. and halt at RIVERHEAD.*
5. Arrangements for signalling and otherwise maintaining communication.		5. *A Signalling Station will be opened at POINT 370 on DUNTON-GREEN - HALSTED road to maintain communication between the Cavalry and main attack.* *Communication with the Xth Division will be maintained by telegraph from RIVERHEAD.*
6. The place to which reports are to be sent, and, when necessary, the position of the officer commanding.		6. *Reports are to be sent to SEAL.*
Signature.		*A.B. Major,* *Brigade-Major* *1st Column.*
Time of issue.		*5 a.m.*

No.	Name of officers to whom issued, and the number of the copy issued to each.	Mode of issue to each, whether orderly, telegraph, verbally, etc.
1	*To O.C. 1st D.G's.*	*Issued to Adjts.*
2	,, *R.A.*	,, ,,
3	,, *1st Bn. R. Scots*	,, ,,
4	,, *1st Bn. Queens*	,, ,,
5	,, *1st Bn. Buffs*	,, ,,
6	,, *1st Bn. R. Lancs. R.*	,,
7	,, *1st Field Co. R.E.*	*by Lt. K.*
8	,, *1st Field Ambulance*	*by Lt. R.*
9	,, *A.S.C.*	*by Lt. O.*
10.	*Office File.*	

2. Orders for Night Attack or Attack at Dawn.

HEADS OF ORDERS.

(*a*) Class to which order belongs.
(*b*) Number.
(*c*) Name of officer issuing order.
(*d*) Force to which it refers.
(*e*) Number of copy on right-hand top corner.

HEADS OF ORDERS.

- *f*) Date, and place of issue on right-hand side.
- (*g*) Maps referred to.

1. General situation—
   - (*a*) As regards one's own troops;
   - (*b*) As regards the enemy. (*See note on* p. 372.)
2. Intention of the officer issuing the orders.
3. Orders to fighting troops—
   - (*A*) Cavalry;
   - (*B*) Artillery;
   - (*C*) Infantry and R.E.
     - (1) Position of assembly—
       - (*a*) Means of recognising it;
       - (*b*) Time of assembly at it;
       - (*c*) Time of departure from it;
     - (2) March to position of deployment.
       - (*a*) Distance to and compass bearing of point of departure.
       - (*b*) Order of march on leaving position of assembly.
       - (*c*) Distances and intervals.
       - (*d*) Any special means for maintaining communication.
     - (3) Position of deployment—
       - (*a*) Means of recognising it;
       - (*b*) Time of departure from it;
       - (*c*) Distance and compass bearing of point of attack.
       - (*d*) Formation to be adopted at position of deployment.

HEADS OF ORDERS.

(4) Assault—
  (*a*) Approximate time of,
  (*b*) Signal for,
    (This may be by rocket or some other means easily seen from all parts.)
  (*c*) Short description of ground to be crossed;
  (*d*) If necessary, any special instructions to be issued.
  (*e*) Description of position to be assaulted.
(5) Steps to be taken if enemy opens fire before assault.

General instructions for all troops—

(i) Magazines should be charged and cut off closed, but rifles should not be loaded; no one is to fire without a distinct order;
(ii) Until daylight, bayonets only are to be used.
(iii) Absolute silence is to be maintained until the moment of assault;
(iv.) No smoking is to be allowed, nor are matches to be struck.
(v) If obstacles are encountered which cannot be readily traversed or removed, the troops will lie down till a passage has been cleared.

The password, and distinctive marks of troops engaged in the attack.

Action after position is captured to resist counter attack—

HEADS OF ORDERS. EXAMPLE.

- (a) Extent to which the captured position is to be fortified and the detail of troops to perform this work;
- (b) Action of reserves on neighbouring troops against positions likely to enfilade captured positions.

4. Orders to—
    - (a) Ammunition columns;
    - (b) Field ambulance;
    - (c) 2nd line transport;
    - (d) T. and S. columns.
5. Arrangements for signalling or otherwise maintaining communications.
6. The place to which reports are to be sent, and the position of the officer commanding at the position of assembly, during the march thence and at the position of deployment as well as his distinguishing mark.

Signature.

Time of issue.

Names of officers to whom issued and number of copy issued to each.	Mode of issue to each whether orderly, telegraph, or verbally, etc.

3. Defence Orders.

(a) Class to which order belongs.	*Copy No.* 1.
(b) Number.	*Operation Order No.* 1.
(c) Name of officer issuing order.	*by*
(d) Force to which it refers.	*Col. R. O.C. 3rd Column.*
(e) Number of copy on right-hand top corner.	
(f) Date and place of issue on right-hand side.	*KNOCKHOLT,* 15 *June*, 1909,
(g) Maps referred to,	*Reference* 1" *Ord. Survey, No.* 287.

HEADS OF ORDERS.	EXAMPLE.
1. The general situation— (*a*) As regards one's own troops ; (*b*) As regards the enemy. (*See note on* p. 372.)	1. *The 2nd Column was at BROMLEY COMMON at 7 a.m. and will be at KNOCKHOLT at 4 p.m.* *The enemy (strength about 2 regiments cavalry, 3 battalions infantry) is reported on reliable information at WROTHAM.*
2. Intention of the officer issuing orders.	2. *The column will take up a position across the RIVER-HEAD-POLHILL-LONDON road and oppose the enemy's advance.*
3. Orders to fighting troops— (*a*) Cavalry ; (1) Distribution ; (2) Special patrols. (*b*) Artillery ; (1) Position ; (2) Orders as to opening fire. (*c*) Infantry : (1) Allotment of defensive line into sections and boundaries of each section. (2) Troops detailed to each section. (3) Time when sections are to be occupied.	3. *3 D.G.'s 1 Sqdn. 3 D.G.'s will cover the R. flank and will send patrols to SUNDRIDGE and CHIPSTEAD.* *The 3 D.G.'s less 1 Sqdn. will cover the left flank.* *Two Batteries R.F.A. will take up a position on POLHILL and will enfilade the WROTHAM-WARREN-HOUSE FARM road.* *One Battery will take up a position on the ridge near the R. of SHOREHAM so as to enfilade the SHOREHAM STATION-SHOREHAM ROAD.* *The defensive line will be from 700′ Hill ¾ m. S.E. of KNOCKHOLT POUND to the top of the ridge about 200 N. of the R. in SHOREHAM.* *The 2nd Bn. Liverpool Regt. will occupy the Section from the KNOCKHOLT POUND-DUNTON GREEN ROAD to the 20th milestone on the DUNTON GREEN-POLHILL ROAD, both inclusive.* *The 2nd Bn. Norfolk Regt.*

HEADS OF ORDERS.	EXAMPLE.
	will occupy the section from the 20th milestone on the DUNTON GREEN-POLHILL ROAD to a point on the ridge 300^x N. of the entrance to the railway tunnel on main line. *The 2nd Bn. Lincolnshire Regt. will occupy the section from a point on the ridge 300^x N. of the southern entrance to the railway tunnel to the top of the ridge about 200 N. of the R. in SHOREHAM* *The sections will be occupied by 12 noon.*
(*d*) Engineers: (1) Distribution; (2) Defensive works which are to be undertaken.	*The 3rd Field Company R.E. less one section will take post at the X roads at POLHILL.* *1 section will remain in reserve under the ridge on the left of the line.* *The bridges at SHOREHAM and OTFORD will be prepared for demolition but not fired without distinct orders from the O.C. Column.*
General reserve. (1) Troops detailed; (2) Position.	*The 2nd Bn. Devonshire Regt. will form the general reserve in the hands of the O.C. Column and will take post in the wood on the COLEGATE — TIMBERDEN BOTTOM ROAD.*
4. Orders to— (*a*) Ammunition columns;	4. (*a*) *The Brig. Amn. Col. will halt at HALSTED. A reserve of ammunition will be established at SHEPHERDS FARM and KNOCKHOLT POUND.*
(*b*) Field ambulance;	(*b*) *The O.C. Brig. Field Amb. will establish dressing stations at SHEPHERDS BARN and X ROADS in Woods ½ m. W. of 20th milestone on LONDON road.*
(*c*) 2nd Line Transport;	(*c*) *The 2nd Line Transport and*

HEADS OF ORDERS.	EXAMPLE.
(*d*) T. and S. Columns.	(*d*) *T. and S. Col. will halt at HALSTED PLACE.*
5. Arrangements for signalling and otherwise maintaining communication.	5. *A signalling station will be established at the end of the ridge on the left of the line and telephone line laid from that point to the main artillery position.*
6. The place to which reports are to be sent, and when necessary, the position of the commander.	6. *Reports will be sent to the O.C. at Polhill near the main artillery position.*
Signature.	*E. F., Major,* *Brigade Major* *3rd Column.*
Time of issue.	10 *a.m.*
Names of officers to whom issued and number of copy issued to each. Mode of issue, whether by orderly, telegraph, verbally, etc.	*No.* 1 *to O.C. 3rd D.G's. issued to Adjts.* 2 „ *R.A.* „ „ 3 „ *2nd Bn. Liverpool R.* „ 4 „ *2nd Bn. Norfolk R.* „ 5 „ *2nd Bn. Lincoln R.* „ 6 „ *2nd Bn. Devons.* „ 7 „ *3rd F. Co. R.E. by Lt. E.* 8 „ *3rd Field Amb. by Lt. F.* 9 „ *A.S.C. by Lt. G.* 10 *Office File.*

4. Special Instructions to an Independent Force.

HEADS OF SPECIAL INSTRUCTIONS.	EXAMPLE.
(*a*) Number.	*Special Instructions No.* 1.
(*b*) Name of officer issuing instructions.	*to Col. B. commanding*
(*c*) Force to which they refer.	*3rd and 4th Hussars,*
(*d*) Date and place of issue on right-hand side.	*WROTHAM HEATH,* 18 *June*, 1909.
(*e*) Map referred to.	*Reference* ½" *Ord. Survey*, No. 40.
1. *If not otherwise given,* The general situation— (*a*) As regards our own troops; (*b*) As regards the enemy. (*See note on p.* 372.)	1. (*In this case, this is given in the Operation Order No.* 3, *p.* 378.)
2. *If not otherwise given,* Intention of officer issuing special instructions.	2. (*In this case, this is given in the Operation Order No.* 3, *p.* 378.)

HEADS OF SPECIAL INSTRUCTIONS.	EXAMPLE.
3. Special instructions.	3. *The G.O.C. wishes you to take your column, as detailed in to-day's Operation Orders, to blow up the Railway line between SITTINGBOURNE and RAINHAM and to attract the attention of the enemy's force in the neighbourhood of SITTINGBOURNE.*
4. *If not otherwise given,* Maintenance of communication.	4. *A Signalling station will be open at Pt. 557 on DETLING-KEY STREET ROAD.*
5. *If not otherwise given,* Position of O.C. and place to which reports are to be sent.	
Signature.	*A.B., Major,* *Brigade Major,* *1st Column.*
Time of issue.	*6 p.m.*

5. Orders for an Advance.

(*a*) Class to which order belongs.	*Copy No. 3.*
(*b*) Number.	*Operation Order No. 3*
(*c*) Name of officer issuing order.	*by*
(*d*) Force to which it refers.	*Br.-Gen. K. 1st Column.*
(*e*) Number of copy on right-hand top corner.	
(*f*) Date and place of issue on right-hand side.	*WROTHAM HEATH,* *18 June, 1909.*
(*g*) Map referred to.	*Reference 1" Ord. Survey, No. 289.*
1. The general situation— (*a*) As regards one's own troops; (*b*) As regards the enemy. (*See note on p. 372.*)	1. *The 2nd Brigade is at LOWER LUDDESDOWN.* *The enemy, strength unknown, is reported in the neighbourhood of PLUCKLEY and HEADCORN.*
2. Intention of officer issuing the orders.	2. *The 1st Column will continue the offensive to-morrow.*
3. Order for cavalry— (*a*) Time of start; (*b*) Direction of march; (*c*) Any special directions.	3. *O.C. Col. B. 3rd and 4th Hussars.* *The 3rd and 4th Hussars will march at 3.30 a.m. in accordance with special*

HEADS OF ORDERS.		**EXAMPLE.**
		instructions to be subsequently issued.
	Cavalry *O.C. Col. C.* *5 D.G.'s* *W. Kent Yeo.* *A. Baty., R.H.A.*	*The troops detailed in margin will march at 4 a.m. by way of OFFHAM and TESTON and will reconnoitre the country between the WROTHAM HEATH - EAST PECKHAM and WATERBURY ROAD and WROTHAM-HEATH - OFFHAM ROAD and OAKEN WOOD.* *They will hold the high ground near QUARRY WOOD 1½ m. S. of BARMING and await orders.* *They will prepare WATERINGBURY, TESTON, BARMING and EAST FARLEIGH Bridges for demolition, but will not fire them unless driven N. of the river.*
4. Orders for advanced guard— (*a*) Time and place of start ; (*b*) Route to be taken ; (*c*) Any special directions.	4. *Advd. Grd.* *O.C. Col. B.* *E. Kent Yeo. (less 2 Sqdrs.) 1st By. R.F.A., 1st Bn. R.*	*The Advanced Guard will be clear of the Cross Roads at HEATH HOUSE by 5.30 a.m. and march to MAIDSTONE via LEYBOURNE and*

Heads of Orders.	**Example.**	
	Scots, 1 Sec. 1st Field Co. R.E.	*DITTON, reconnoitring to NEW HITHE and AYLESFORD and driving East any hostile bodies.*
5. Order for main body— (*a*) Time and place of start; (*b*) Distance or time in rear of advanced guard. (" The initial point " where the heads of units are to join the column should be stated.) *See March Table*, p. 393.	5. *Main body (in order of march).* —— *Brig. Hdqrs.* *1st Bn. The Queens* *2nd and 3rd Batteries R F.A.* *1st Bn. The Buffs* *1st Bn. R.Lancs.(less one Co.)* *1st Field Co. R.E. (less 1 section)* *Brig.Amn.Col.*	*The head of the main body will pass the Cross Roads at HEATH HOUSE at 6 a.m. marching from WROTHAM HEATH and will follow the A.G. at 1½ miles.*
6. Order for flank guard— (*a*) Time and place of start; (*b*) Route to be taken; (*c*) Any special directions.	6. *Flank Gd.* —— *O.C.* *Major C.* *2 Sqdrs. E. Kent Yeo.*	*The Flank Guard will march at 5.45 a.m. to EAST FARLEIGH BRIDGE by way of W. MALLING and E. MALLING.* *They will take up a position covering EAST FARLEIGH BRIDGE and await orders.*
7. Orders to outposts— (*a*) Time and place at which to close on the column.	7.	*The Outposts will withdraw when the Advanced Guard has passed their line and will join the main body at Point 215.*

HEADS OF ORDERS.	*In order of march.*	EXAMPLE.
8. Orders to— (*a*) Ammunition Columns; (*b*) Field Ambulance; (*c*) 2nd Line Transport; (*d*) T. and S. Columns.	8. *Brig. Amn. Col. Field Amb. 2nd Line T. T. and S. Col. under command of Major N. Escort I Co. R. Lancs. R.*	(*a*) *The Brigade Amn. Col., Field* (*b*) *Amb., 2nd Line* (*c*) *Transport and* (*d*) *T. and S. Col. will march from the Heath at 6.30 a.m. and follow the main body in the order named.*
9. Position of O.C. and place to which messages are to be sent.	9. *The O.C. will march at the head of the main body.*	
Signature.		*A.B. Major,* *Brig. Major,* *1st Column.*
Time of issue.	*5 p.m.*	
Names of officers to whom issued, and number of copy issued to each. Mode of issue, whether by orderly, telegraph, or verbally, etc.		

No.			
1	*to O.C.*	*5 D.G's.*	*issued to Adjts.*
2	,,	*R.A.*	,, ,,
3	,,	*W.K.Y.*	,, ,,
4	,,	*E.K.Y.*	,, ,,
5	,,	*1st Bn. R. Scots*	,,
6	,,	*1st Bn. R. Lancs.*	,,
7	,,	*1st Bn. The Queens*	,,
8	,,	*1st Bn. The Buffs*	,,
9	,,	*1st Field Co. R.E. by Lt. N.*	
10	,,	*1st Field Amb. by Lt. O.*	
11	,,	*A.S.C. by Lt. P.*	
12	,,	*Office File.*	

6. Advanced Guard Orders.

(Based on previous Orders for an Advance.)

(*a*) Class to which order belongs.
(*b*) Number.
(*c*) Name of officer issuing order.
(*d*) Force to which it refers.
(*e*) Number of copy on right-hand top corner.
(*f*) Date and place of issue on right-hand side.
(*g*) Maps referred to.

HEADS OF ORDERS.

1. The general situation—
   - (*a*) As regards one's own troops;
   - (*b*) As regards the enemy.

   (*See note on p.* 372.)
2. Intention of the officer issuing the orders.
3. Van guard.
   - (*a*) Place of assembly.
   - (*b*) Time of start.
   - (*c*) Road to be taken.
   - (*d*) Any special orders as to engaging the enemy if he is met in force.
4. Main guard.
   - (*a*) Place of assembly.
   - (*b*) Time of start.
   - (*c*) Order of march. *See March Table, p.* 393.
   - (*d*) Road to be taken.
5. Flank guard.
   - (*a*) Place of assembly.
   - (*b*) Time of start.
   - (*c*) Road to be taken.
   - (*d*) Any special orders as to engaging the enemy if he is met in force.
6. Position of O.C.

Signature.

Time of issue.

Names of officers to whom issued, and number of copy issued to each.	Mode of issue, whether by orderly, telegraph, or verbally, etc.

7. Orders for Retreat.

- (*a*) Class to which order belongs.
- (*b*) Number.
- (*c*) Name of officer issuing order.
- (*d*) Force to which it refers.
- (*e*) Number of copy on right-hand top corner.

HEADS OF ORDERS.

- (*f*) Date and place of issue on right-hand side.
- (*g*) Maps referred to.

1. General situation—
    - (*a*) As regards our own troops;
    - (*b*) As regards the enemy. (*See note on p.* 372.)
2. Intention of officer issuing the order.
3. Orders to Amn.Cols.,FieldAmb., 2nd Line T., T. and S. Cols.—
    - (*a*) Place of assembly;
    - (*b*) Time of start;
    - (*c*) Road to be taken;
    - (*d*) Escort.
4. Advanced guard—
    - (*a*) Place of assembly;
    - (*b*) Time of start;
    - (*c*) Road to be taken;
    - (*d*) Any orders as to preparing bridges for demolition.
5. Main body—
    - (*a*) Place of assembly; *See March Table, p.* 393.
    - (*b*) Hour of start;
    - (*c*) Road to be taken.
6. Rear guard—
    - (*a*) Place of assembly;
    - (*b*) Hour of start;
    - (*c*) Any special instructions such as taking up rear guard positions.
7. Flank guard—
    - (*a*) Place of assembly;
    - (*b*) Hour of start;
    - (*c*) Route to be taken;
    - (*d*) Any special reconnaissance;
    - (*e*) Occupation of any position.
8. Orders for outposts—
    - (*a*) Time when they are to withdraw;
    - (*b*) Position they are to take in column of route.

HEADS OF ORDERS.

9. Position of O.C. and place to which reports are to be sent.

Signature.

Time of issue.

Names of officers to whom issued, and number of copy issued to each.	Mode of issue, whether by orderly, telegraph, or verbally, etc.

8. Rear Guard Orders.

(Based on previous Orders for a Retreat.)

(*a*) Class to which order belongs.
(*b*) Number.
(*c*) Name of officer issuing order.
(*d*) Force to which it refers.
(*e*) Number of copy on right-hand top corner.
(*f*) Date and place of issue on right-hand side.
(*g*) Maps referred to.

1. The general situation—
   (*a*) As regards one's own troops;
   (*b*) As regards the enemy.
   (*See note on p.* 372.)
2. Intention of officer issuing orders.
3. Order for main guard—
   (*a*) Place of assembly;
   (*b*) Hour of start;
   (*c*) Any special direction as to holding any position.
4. Order for flank guard.
5. Order for rear party.
6. Order for rear guard cavalry.
7. Position of O.C.

See March Table, p. 393.

Signature.

Time of issue.

Names of officers to whom issued, and number of the copy issued to each.	Mode of issue, whether by orderly, telegraph, or verbally, etc.

9. Night March Orders.

HEADS OF ORDERS.

- (*a*) Class to which order belongs.
- (*b*) Number.
- (*c*) Name of officer issuing order.
- (*d*) Force to which it refers.
- (*e*) Number of copy on right-hand top corner.
- (*f*) Date and place of issue on right-hand side.
- (*g*) Map referred to.

A. *The general situation.*
- (*a*) *As regards one's own troops.*
- (*b*) *As regards the enemy.*

(*See note on p.* 372.)

B. *Intention of the officer issuing the orders.*

[NOTE.—A *and* B *are excluded from night march orders, but are communicated confidentially to O.C. Advanced Guard, Flank Guards and O.C. Battalions and Cavalry.*]

1. General march orders—
   - (*a*) Starting point;
   - (*b*) General compass bearing during march.
2. Orders for advanced guard—
   - (*a*) Hour of start;
   - (*b*) Guide;
   - (*c*) Directions as to blocking side roads.

See March Table, p. 393, *but destination will not be stated though communicated confidentially to O.C.'s.*

3. Orders for flank guards—
   - (*a*) Hour of start;
   - (*b*) Guide;
   - (*c*) Any special directions as to occupation of positions.
4. Orders for main body—
   - (*a*) Hour of start.
5. Orders to: (*a*) Amn. Columns; *b*) Field Ambulance; (*c*) 2nd Line Transport; (*d*) T. and S. Cols.

HEADS OF ORDERS.

6. Time and duration of halts.
7. Orders in case of attack.
8. Special instructions—
   No rifles should be loaded and no one is to fire without a distinct order.
   Until daylight, bayonets only are to be used.
   Absolute silence is to be maintained.
   No smoking is to be permitted nor are matches to be struck.
9. Pass-word—
   Distinguishing mark for troops.
10. Position of O.C. and his distinguishing badge.

Signature.

Time of issue.

Names of officers to whom issued, and number of the copies issued to each.

Mode of issue, whether by orderly, telegraph, or verbally, etc.

10. Halt Orders.

(*a*) Class to which order belongs.
(*b*) Number.
(*c*) Name of officer issuing order.
(*d*) Force to which it refers.
(*e*) Number of copy on right-hand top corner.
(*f*) Date and place of issue on right-hand side.
(*g*) Maps referred to.

1. The general situation—
   (*a*) As regards one's own troops;
   (*b*) As regards the enemy.
   (*See note on p.* 372.)
2. Intentions of officer issuing the order.
3. Orders for outposts—
   (*a*) Commander;

HEADS OF ORDERS.	EXAMPLE.
(b) Troops ;	
(c) General line of outposts ;	
(d) Action in event of attack ;	
(e) Any special directions as to patrols or preparing position for defence.	
4. Orders for main body— Camp, bivouac or billet ; Special defensive measures in addition to outposts.	
5. Orders to : (a) Amn. Columns ; (b) Field Ambulance ; (c) 2nd Line Transport ; (d) T. and S. Columns.	
6. Position of O.C.	
Signature.	
Time of issue.	
Names of officers to whom issued, and number of the copy issued to each. Mode of issue, whether by orderly, telegraph, or verbally, etc.	

11. Outpost Orders.

(a) Class to which order belongs.	*Copy No. 1.*
(b) Number.	*Outpost Order No. 1.*
(c) Name of officer issuing order.	*by*
(d) Force to which it refers.	*Lt.-Col. A., R. Scots, O.C. Outposts.*
(e) Number of copy on right-hand top corner.	
(f) Date and place of issue on right-hand side.	*FAIRBOURNE HEATH,* *19 June, 1909.*
(g) Maps referred to.	*Reference 1" Ord. Survey, No. 288.*
1. The general situation— (a) As regards one's own troops, so far as they affect the outposts ; (b) As regards the enemy. (*See note on p. 372.*)	1. *The camp is at CHEGWORTH COURT.* *The Cavalry is at CHART CORNER. The 3rd Brigade at STEDE HILL and the 2nd Brigade at MILSTED.* *The enemy (strength from 2 to 3 Infantry Brigades) is reported by our scouts to be at PLUCKLEY*

HEADS OF ORDERS.	EXAMPLE.
	and SMARDEN and 1 Infantry Brigade at HOTHFIELD. Two Cavalry regiments are reported on reliable information at STAPLEHURST.
2. Outpost line— (*a*) General line to be taken up; (*b*) Division among outpost companies and limits of ground allotted to each, and roads it is to guard; or, if necessary, the divisions of the line into sections, and name of commander of each section and troops allotted to it.	2. *The outpost line will be from ULLCOMBE CHURCH to X roads at PLATT'S HEATH, both inclusive.* *1st Section ULCOMBE CHURCH to ELMSTONE HOLE both inclusive. O.C. Major B. 4 Cos. 1st Bn. R. Scots.* *2nd section ELMSTONE HOLE to PLATT'S HEATH, inclusive. Major C. 4 Cos. 1st Bn. R. Scots.*
3. Orders to outpost mounted troops— (*a*) Dispositions: (1) Line of observation posts (if any), and when they are to be withdrawn; (2) Section (if any) of the outposts to which they are to be attached; (3) Portion (if any) of the outpost line which they are to hold; (4) Any special direction as to touch with the enemy, patrols and places to be especially watched.	3. *The East Kent Yeo. less 2 Sqds. O.C. Col. D. will take up a line of observation posts: CHARING HEATH—PEMBLES CROSS — BROADSTONE—JUBILEE FARM. They will be withdrawn at 8.30 p.m. and form the reserve at FAIRBOURNE.* *2 Troops East Kent Yeo. will be attached to each of the supports.* *The SOUTHERNDEN-BROADSTONE road will be especially watched by the E. Kent Yeo.*
4. Orders for outposts, companies, squadrons— (*a*) General line of piquets; (*b*) General line of supports; (*c*) Any special patrols. (*d*) Any special as to persons wishing to enter or leave the outpost line.	4. *The general line of piquets will be ULCOMBE CHURCH—KNOWLE HILL—LIVERTONSt.—PLATT'S CORNER.* *The general line of supports will be PLATT'S HEATH-CHART CORNER ROAD.* *Standing patrols will be detailed by the supports to take up a*

HEADS OF ORDERS.	EXAMPLE.
	position at 9 *p.m. at JUBILEE CORNER, BROADSTONE, COLDBRIDGE FARM, HAZELWOOD HILL and CHAPEL FARM.* *No civilian is to be allowed to pass out of the line.*
5. Reserve (if any)— (*a*) Troops detailed ; (*b*) Position ; (*c*) Any special directions as to state of readiness.	5. *The East Kent Yeo. less* 1 *Sqd. will form the reserve at FAIRBOURNE.*
6. Special measures (if any) for strengthening the position, *e.g.*, demolition of bridges, preparing buildings for defence, improving communications, barricading roads, etc.	6. *The BOUGHTON MALHERBE and PLATT'S HEATH and GRAFTY GREEN roads will be barricaded.*
7. Action in event of attack and the degree of resistance to be offered.	7. *In event of attack the line PLATT'S HEATH—LIVERTON STREET—KNOWLE HILL—ULCOMBE CHURCH will be held until reinforced. The main body will occupy this line.*
8. Supplies and cooking— (*a*) Provision of supplies ; (*b*) How far fires are to be allowed. (*c*) Whether smoking allowed.	8. *Supplies will be drawn from the* 2*nd line transport at CHEGWORTH COURT.* *Fires with the piquets or supports will not be kept alight after* 8.30 *p.m.* *Smoking is permitted.* *Signalling communication will be maintained between PLATT'S HEATH and the* 3*rd brigade on the hill above LENHAM.*
9. Time at which the outposts will be relieved.	9. *The outposts will be relieved at* 10 *a.m.,* 20*th June,* 1909.
10. Countersign.	10. *The countersign is SENEKAL.*

HEADS OF ORDERS.	EXAMPLE.
11. Position of O.C. and place to which messages are to be sent.	11. *The O.C. outposts will be with the reserve at FAIRBOURNE.*
Signature.	*A.A.* *Lt.-Col.* *O.C. outposts.*
Time of issue.	*4 p.m.*
Names of officers to whom issued and number of the copy issued to each. Mode of issue, whether by orderly, telegraph, or verbally, etc.	*No. 1 to O.C. 1st Column by Pte. A.* *,, 2 to Maj. B. by Corp. S.* *,, 3 to Maj. C. by Corp. T.* *,, 4 to Col. D. by Sgt. R.*

March Table.

It is laid down that in orders for the movement of large bodies of troops, it is often convenient to show in a March Table issued with Orders :—(1) The detail of the troops in their order in the columns of march ; (2) Their starting points ; (3) Hours of marching ; (4) Route to be followed ; (5) Destination ; (6) Place from which supplies are to be drawn.

Messages.

A message should begin with the name of unit or formation to which the message is addressed followed by the number of the sender's message and the day of the month. If the message refers to or is in reply to any message from the addressee, the number of that message should then be quoted. The message must be legibly written so that it can be read by the light of a candle. At the end of the message the sender and place and time of despatch should be given.

PART X.

HORSE MANAGEMENT, PREVENTION OF DISEASE AND INJURIES, AND VETERINARY FIRST AID.

HORSE MANAGEMENT AND PREVENTION OF SICKNESS AND INJURY.

Importance of Horse Management.

Horse management is one of the most important subjects to which an officer or non-commissioned officer has to give his attention, inasmuch as the efficiency of his squadron, troop, or section, as a fighting cavalry unit, depends to a large extent on the capacity of the horses, and the capacity of the horses depends on their condition.

Inculcating feeling of Proprietorship.

The feeling which it is particularly desirable to inculcate in the men is the feeling of proprietorship of their horses, and every means towards this end should be employed, since the fostering of this spirit will go far to make the men good horse-masters. There is perhaps nothing more destructive of this spirit than the feeling that horses can easily be replaced. This feeling was responsible for a great deal of the large wastage of horses in the late war in South Africa. Men cannot be trained to place too high a value on their horses.

Principles of Feeding and Watering.

(*a*) *Water before Feeding.*

A horse will drink from 4 to 8 gallons of water a day, the quantity depending on the climate and the nature of the work. Eight gallons a day is computed as the allowance while on board ship.

The proper time for watering is immediately after work and before reaction to fatigue. If horses are not watered at once, they should not be watered for an hour. They should never under any circumstances be stinted of water, but they should not be made to move out of a walk for 30 or 40 minutes after full watering. On the line of march every opportunity should be taken to give them water, more especially in hot weather. An officer should superintend the watering of horses on the march and in camp.

A grave responsibility rests with those in charge of large numbers of spare horses, as for instance in remount camps, to see that their horses get sufficient water. The practice of tying horses in open lines, especially in tropical climates, and depending on their being led to water, frequently results in a large amount of suffering.

The same remarks apply with regard to remount trains on lines of communication. Thoughtlessness may result in an extreme amount of suffering from thirst.

(*b*) *Feed in small quantities and often.*

The fact that the stomach of a horse is small points to the necessity for frequent feeding in small quantities. The intestines, on the other hand, being very large, a considerable bulk of forage is required to fill them. If bulk is withheld, horses will eat earth or sand in large quantities to fill up the void.

They will not thrive if bulk of forage is withheld from them, even if highly nutritive food is given them in concentrated form. Accordingly it is desirable to feed frequently with nutritive material, such as oats, in small quantities at a time, and to give considerable bulk in the shape of hay during the hours of rest. For horses in full work the regulation allowance of 10 lbs. of oats and 12 lbs. of hay as a rule supplies the necessary nutrition and bulk.

For horses not in full work the nutritive food may be reduced according to the work which they do, and its place taken by an increase in bulk. Horses that are turned out to grass obtain from the grass the whole or the greater part of the required bulk.

Horses out of condition are unable to digest a full grain ration, and if it is given to them a large percentage of the nutritive material is wasted, since they can only assimilate a small quantity, and consequently the system becomes clogged with the remainder. Accordingly a very small ration, say, about 4 lbs. of oats, should be given for the first two or three days. After this, the ration should be gradually increased, say, by a pound or two a day until the limit of the full ration is reached. The horse should from the time when he is brought up be put to steady slow work, which should be increased daily. This work will gradually build up muscle, and with this will come the power of assimilating an increased amount of grain. If a horse is subjected to over-exertion or fatigue before this process is sufficiently advanced, his progress will be put back indefinitely, and it may even be the beginning of hopeless debility.

When horses are landed after a long sea voyage, during which they have received but a small grain ration, they should go through a modified form of the conditioning process outlined above; that is to say, their grain ration should be gradually increased from that which they have been receiving on board ship, unless of course they have during the last few days of the voyage been receiving a full grain ration, while their work should be similarly increased.

A horse that is in condition should feel firm along the arch of the neck and in the flanks and quarters. Leanness is of course no proof of a horse not being in condition, since a horse may be very lean and yet essentially in condition, having acquired and retained the power of digesting hard grain to his full individual capacity. What is given to him is turned into muscle, and even perhaps when he is leanest he is capable of standing both hardship and fatigue.

Since horses are naturally affected by shortness of food, every opportunity must be taken on service of supplementing the grain ration by collecting additional forage.

(c) *Do not work immediately after a full feed.*

Immediately after a full feed the stomach and bowels are actually bigger than before, and if hard work is given directly after a meal they press against the lungs, impeding the lungs' power of expansion, thus leading to blowing and distress. Fast work should, therefore, be avoided after a full feed.

The Quality of Forage.

It is almost needless to say that in order to get the most out of horses it is necessary that their forage should be of good quality.

Hay.

Hay of good quality should feel hard and crisp and have a distinctive colour. If it has these characteristics it is not absolutely necessary to examine the grasses of which it is made up, since indifferent grasses are known to be foreign to good hay.

Hay of indifferent quality feels soft. The expression "fit only to wrap bottles in" describes it sufficiently. It is soft because the grasses in it are poor, being grown on inferior or badly drained land.

Apart from the actual quality of the grasses of which the hay is composed, it should have been well made and preserved from damp. If it has been badly made, it will lack that lustre which is characteristic of well-made hay of good quality, and if it has suffered from damp, it will have a musty smell, which is easily distinguishable.

Oats.

Oats should feel hard when bitten. If soft, they are too new. The slightest unsoundness is evident by the smell of must or of kiln-drying. Badly-damaged oats are darker in colour, and may be actually sprouting.

Generally speaking, the best oats are British oats, the next Russian, and the next American.

The heavier oats are per bushel the better they are. The very best oats should weigh 44 lbs. per bushel; but good average oats, such as are supplied under army contracts, should weigh at least 40 lbs. per bushel.

Bran.

Good bran is made up of large flakes, and contains much flour. The better the milling process the poorer the bran. Unsoundness is easily detected by the smell.

General Conditions Affecting Horses on Active Service.

Advantage of Horses being in the Open.

Life in the open being natural to horses is distinctly to their advantage. Amongst the hundreds of thousands of horses in South Africa during the war catarrh and pneumonia were practically unknown, whereas these diseases appeared directly stables were resorted to after the war.

Exposure to Great Cold.

Horses are capable of standing extreme cold, provided their natural powers of resistance are not enfeebled by recent residence in stables. Consequently when they are to be exposed to great cold, they should, as far as possible, be gradually acclimatised to it.

Exposure to Sun Heat.

Horses are far from indifferent to the effect of extreme sun heat. In tropical countries nearly all horses are the subjects of latent malaria (tropical biliary fever). If they are tied up continuously in intense sun heat in lines without relief, there will, after a time, be in a large percentage of cases a rise of body temperature. If the horses are poor in condition, or if water in sufficient quantity is held from them, fever will be intensified. This will go on just so long as they are left under these conditions, the body temperature rising in the daytime and dropping a few degrees at night. On the other hand, if they are removed to shade, the temperature drops to normal even without treatment. This condition is unfortunately not always recognised, because, as a rule, they continue to eat what is given to them. Spare horses, or derelicts, collected in large numbers, because they are kept inactive in this way, are particularly liable to suffer from this kind of fever. The tissues continue to be burnt up day by day until such cases become nothing but skin and bone.

Value of Freedom.

It is sometimes practicable on service to give horses a great measure of freedom, especially in standing camps.

If horses are kept loose, instead of being tied up in lines, they make the most of a little shelter and of shade, and, in addition to this, can at all times be given access to water. By letting a few out to graze one day, and a few more the next, and so on, they can be gradually accustomed to being loose. They can even be driven gently for miles in this way and brought back again, thus affording opportunities for exercise when it is probably impracticable to get it in any other way. At least one cavalry regiment in South Africa, while in a standing camp, turned their horses out almost all day and every day. These horses remained separate in squadrons, herded only by a few men. They stood to be caught even when the men ran towards them. If a feed-tin had been rattled, there is no doubt that they would have learnt to return at the signal. Under conditions such as these the skin is far more healthy, and there is less need of grooming.

Remount Management.

Remount management is a specialised business. With large accumulations of horses, individual care becomes impracticable. Such accumulations are divided into groups of a convenient number; and the horses can be exercised, watered, and fed as loose horses, and conditioned uninterruptedly until they are issued. In the late war in South Africa, Major Eassie, D.S.O., evolved an automatic method of managing remount depots and veterinary hospitals. A description of Major Eassie's methods appeared in the earlier editions of this book and may be found also in Smith's " Veterinary Hygiene."

Marching.

Preliminary Marches.

When horses are out of condition, or have just been landed from a ship, the first march should not exceed eight miles, at a very slow pace, otherwise a number of cases of laminitis (founder) are bound to occur. Liability to this on the second day's march is considerably lessened; but a very slow march is still imperative. On the third and subsequent days marches may be safely increased.

Hour of Start.

It is now laid down that only in exceptional circumstances should squadrons move off at such an early hour as to interfere materially with the night's rest of the horses.

Pace on the March.

Since slow marching wears out horses, the march should be got over, and the weights off their backs, as soon as possible.

Unless the march is a forced one, the pace should be regulated by that of the slower horses, and, where the mounted troops are travelling beyond a walk, full advantage should be taken of every good bit of ground to trot over, so that when a rough piece is reached the pace can be made easier. In an average country the rate of march is usually five miles an hour, including halts.

Advantage of Maintaining a Steady Pace.

The leading section of each troop should not trot or walk out unless specially ordered, or else it entails the rear of the troop continually cantering or trotting to keep up.

The non-commissioned officers in the centre of each troop or squadron should not let their men drop back while in column of sections.

Intervals between Troops.

In order to avoid reining up horses continually, it is advisable, when tactical conditions allow, to maintain a distance of from 50 to 100 yards between each troop on the march.

Dismounting.

It is advisable to dismount occasionally on the march and lead the horses, for besides removing the dead weight off the horses' back it relieves the men of the irksomeness of sitting for long hours in the saddle.

When halted on the march, the non-commissioned officers must see that the men dismount and do not sit on their horses, unless the halt is momentary. They must also see that the men dismount when ascending or descending steep hills.

Method of Making a Horse Stand or Preventing it Run Away.

One method of making a horse stand or of preventing it run away is by passing the bridoon reins over its head and between its fore legs; then passing the ends of the reins through the girth from front to rear and slipping the stirrup through.

Halts.

An early halt should always be made on a march in order to adjust saddlery.

On long marches and field days frequent halts should be made, and girths slackened, and the saddle removed, since every minute's rest eases the horses' backs. Circulation is restored to the skin-veins by rubbing the back with the open hand. Horses should be encouraged to stale, if they have not already done so, and if they want to, should be allowed to roll. In addition to being regularly watered and fed, they should, when it is practicable, be permitted to graze.

In hot weather shade afforded even for a short time has a marked benefit on a horse which has been long exposed to the sun.

When Halting in Wind or Rain.

During a halt in wind or rain the horses should be turned with their backs to it, as they always do when loose. If the weather is very cold, and no shelter is available, the horse should be kept slowly moving, if the situation allows.

Unfit horses with long coats which are sweating run a dangerous risk when halted in wind, since there is a rapid lowering of body temperature, in the same way as water in a bottle is cooled by wrapping the bottle in a wet cloth and putting it in the wind. Owing to this, congestion of the lungs may result ; consequently such horses should, if possible, be halted in good shelter, or, if this is not possible, should be kept gently moving.

Care of Horses in Camp.

Formation of Camp.

The general formation of a cavalry camp is given in Plate 47, p. 581 ; of an Artillery, Royal Engineers, or any other camp in which there is transport, in Plate 48, p. 582.

Position of Horse-lines.

If a choice of ground for horse-lines is possible, the most suitable, in climates and seasons where there is likely to be much rain, is ground with a slight slope and on a gravel or sandy soil. The slope will afford natural drainage, while gravel or sand will be found most permeable, and will therefore dry quickest. In cold, wet, or windy weather horses should, if possible, be placed with their tails to the wind, but in hot weather they should face the breeze. Wind screens can easily be made of rough stone, turf walls, hurdles, or straw placed to windward.

In the tropics, endeavours should be made to get as much shade as possible, particularly of course during the hottest parts of the day. Numnahs or blankets should be left on the horses, cooling their loins. Horses should be picketed in line facing away from the prevailing winds if possible.

Size of Picket-lines.

A horse when picketed requires a frontage of about two paces, and a distance of five paces from picket-line to tent-peg. When horses are fresh from stables it may be necessary at first to increase the frontage.

A gangway of two paces will be maintained between two-horse-lines, and between a horse-line and the nearest building, wall, etc., or the pegs of the nearest tent.

Changing Position of Horse-lines.

Even if ground does not become sodden with rain and unduly broken up, the position of horse-lines should be changed at least every ten days, since the continual soaking of the ground with urine tends to make it unhealthy, particularly for horses which are kept on the lines during a great part of the day. The old position can be safely used again after, say, a week or ten days.

Sanitation of Horse-lines.

The sanitation of horse-lines needs constant attention. Small drains should be cut to allow rain water to run away easily. Dung and other refuse should be removed to a considerable distance to leeward of the lines at frequent intervals, and care must be taken not to place the refuse heaps near to a stream from which water is taken for drinking purposes.

Picket Ropes above the Ground.

If trees or wagons are available, it is often best to tie the picket rope to the trees or wagons about three feet above the ground, because the horses are less likely to get their head ropes twisted together, or to get their hind legs over it. The horses can be tied on to either side of the picket rope, the head ropes having been made long enough to allow them to lie down. Horses prefer to rest with their fore quarters slightly downhill.

Methods of Securing Horses.

(1) *Picketing.*

Where heel ropes are used the Manual states that the proper method of picketing a horse is as follows :—" When standing up, with his head over the picket rope or peg, the length of the head rope should be from the lower ring of the back strap to the ground, and no longer, and the heel ropes should in the same position be just taut. This allows the horse to do anything except get his hind feet above the head rope."

(2) *Knee-haltering.*

Knee-haltering is one of the best methods of hobbling a horse. The head rope should be tied round the fore leg just above the knee with a clove hitch, and a half hitch to prevent it slipping, and should be of such a length that, when standing evenly on both fore legs, the horse is not able to raise the top of his head higher than his withers. If a horse is to be knee-haltered for a long time, a piece of soft material should be placed under the knot to prevent it from chafing.

(3) *Shackling.*

It is best to put shackles above the fetlock. The buckle should be just tight enough to prevent the shackle slipping down on to the pastern. Shackles should be frequently changed from one leg to the other.

(4) *Coupling when Saddled.*

Place the horses head to tail, tie the reins of each round the back stay of the rear arch of the other's saddle.

If horses have to be linked for a short time when bridled, a good plan is that suggested by Major R. H. Lindsay, Royal Scots Greys. The bridoon reins of each horse are taken over the animal's head, then passed through the D on the off-side of the head of the horse on the left, and down through the D on the near side of the man's own horse.

(5) *Heads in a Circle.*

This can be effected by (*a*) tying the head rope of each horse to the head collar of the next horse. When 10–16 have been coupled in this way, tie the two flank horses together and so form a circle.

(*b*) Tie the head rope of each horse to a metal ring about 18 inches in diameter, and place some fodder in the centre.

Grooming Horses in Camp.

Grooming should, generally speaking, be carried out as in stables, special attention being given to manes and docks with a view to cleaning off ticks, detecting heat spots and scurf. A look-out should also be kept for any signs of mange or ringworm. For symptoms, see pp. 439, 440.

Watering Places.

The allotment of watering-places is subsequently dealt with on p. 594. A non-commissioned officer should always be placed in charge of the watering place. In order that the first horses coming up may not foul the stream for those coming up later, he should see that the watering is first started at the lowest part of the allotted length of stream.

Horses should not, as a rule, be brought down to water in batches. If, however, owing to shortage of men, this has to be done, it is important to see that one or two horses who perhaps drink faster than the others do not drag the others away before they have drunk their fill.

If running water is not available, a rough barbed wire fence, or some other form of fencing should be placed round the water supply to keep out animals which should, in this case, be watered by bucket or nose-bag.

PREVENTION OF INJURIES.

Saddle Injuries.

Portion of the Back capable of carrying Weight.

The only portion of the back which is intended to carry weight is the region on both sides of the spine formed by the upper part of the ribs. Below this point the ribs are freely movable in breathing, so that a pack load which slips down so far is bound to cause injury.

Plate II shows a section of a horse taken just in rear of the withers. From this it will be seen that the only portion capable of bearing weight is that marked (*a*) and (*a*), while all pressure must be removed from (*c*) and no pressure other than the girths and surcingle must be allowed on (*b*) and (*b*).

Causes of Injuries.

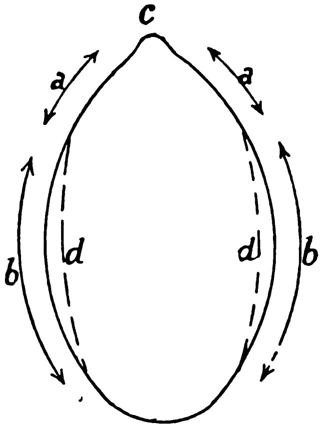
Sore backs are due either to undue pressure on one part or to friction.

(*a*) *Undue Pressure.*

Undue pressure arises from a badly fitting saddle tree, from some inequality in the stuffing of the panel of the saddle, or from some portion of the saddle pressing on the spine.

PLATE 11.

Section of horse's back immediately in rear of withers shewing portion of back capable of bearing weight.



a — Upper arch of ribs immovable and capable of heavy weight.

b. — Side wall of chest freely moveable in respiration A pack load descending on to "b" will cause a sore back from friction

C. — Spine where the least pressure is intolerable

d — Variation in breathing

(*b*) *Friction.*

Friction, on the other hand, is caused by the moving of the saddle against the skin.

Prevention of Unequal Pressure and Friction.

We have now to consider the best means of preventing both unequal pressure and friction.

As regards pressure, it is clear that if an inequality of the saddle presses directly on the back without an intervening numnah or blanket, the area of the skin which is pressed upon corresponds with the size of the object pressing upon it, and an injury results.

But if a folded blanket or numnah is used, any unequal pressure is distributed over a much larger area, and consequently that area is less liable to injury and, if injured, suffers to a less degree ; while if the numnah or blanket is very thick, say an inch, any unequal pressure is dispersed over so large an area that injury can hardly result.

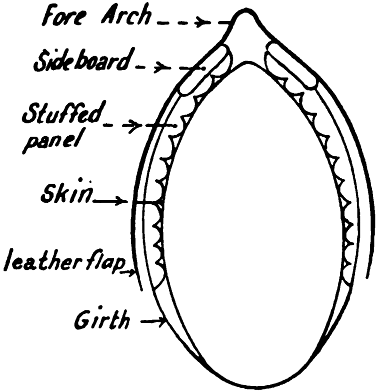
Consequently it is clear that in endeavouring to prevent unequal pressure a very considerable advantage arises from the employment of a thick numnah or folded blanket.

As regards friction, it is evident that when the saddle is carried directly on the back there is friction between the saddle and the back, and the greater the thickness there is in the saddle—as in a saddle with a full-stuffed panel—the greater is the liability to swaying of the load above it, and consequently the greater the degree of friction upon the skin. But if an unpadded saddle rests on a thick numnah or folded blanket, the greater part of the friction movement is lost before it reaches the skin, and there is but little liability of friction between the blanket or numnah and the skin.

In conclusion, therefore, it may be said that an unpadded saddle used with a numnah an inch thick or more, or with a folded blanket, is the best means of preventing of sore backs arising either from pressure or friction, a thick numnah being

PLATE 12.

Section of horse's back showing saddle fitted with a stuffed panel


Fore Arch
Sideboard
Stuffed panel
Skin
leather flap
Girth

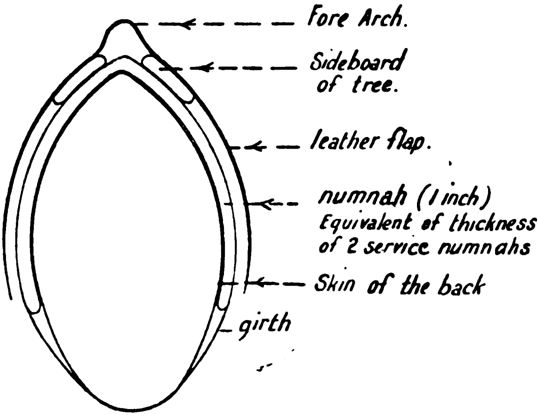
Pressure from any inequality of the Saddle is directly on the skin.

Friction is of maximum limit because the pad shifts under the weight of the man and directly on the skin

The man when using a thick stuffed panel sits away from his horse accordingly the movement between the skin and the saddle is greater than if he were sitting close to the horse.

PLATE 13.

Section of horses back shewing saddle and numnah


Fore Arch.
Sideboard of tree.
leather flap.
numnah (1 inch) Equivalent of thickness of 2 service numnahs
Skin of the back
girth

Any pressure from inequality of saddle is diffused owing to thickness of numnah.

Friction is minimised because (1) the man sits closer than when using a stuffed panel (2) the numnah not being a part of the saddle does not move under the weight of the man and the friction which occurs does not take place between the numnah and the skin but between the numnah and the saddle and owing to the thickness of the numnah is diffused within its substance.

preferable, because it leaves less to care and intelligence than is the case when a folded blanket is used.

Supervision of Saddling.

Officers and non-commissioned officers, as well as the men themselves, must at all times see that care is given to the saddling of horses. But later in a campaign, when so much "makeshift" saddlery is in use, and the horses have fallen away in condition, the supervision of saddling becomes even more important.

It must be impressed on the men that if sore backs occur they are themselves responsible. There is only one cause of a sore back; it is not the horse or the saddle, but want of care on the part of the rider.

Recruits so often cause sore backs—

(1) By not strapping the numnah front and rear.

(2) By allowing the loose end of a strap to get in between the numnah and blanket and the horse's skin.

(3) By allowing some portion of the rear pack of the saddle to rest on or even touch the horse's spine.

(4) By putting the saddle on in a hurry and allowing the suret or panel flaps to get turned up, thus forming a hard thick ridge.

(5) By having loose girths and a tight surcingle.

Troop officers should have the horses continually under their eye, and should see that the men do not loll about in their saddles when tired, as this is a fruitful cause of sore backs.

Inspection of Horses after a March.

When the horse-lines are down and the saddles are taken off, each non-commissioned officer should see that the men examine their horses, and ascertain if any have sore backs, girth-galls, or other injuries. A sore is usually not the result of one day's work only, but of several days' undue pressure on the part affected. Hence the first symptoms of any trouble in this direction should be discovered and treated without delay. It can usually only be discovered in its initial stages by a close inspection.

Treatment of Swellings.

During the first few days of a march swellings may often be noticed, as the skin has not yet got accustomed to the pressure of the saddle. In order to prevent, if possible, their reaching the " sore " stage, gentle massage should be applied to these swellings, as this alone will often help to reduce them. If the skin on the spot is unbroken, a cloth should be saturated in cold water and laid over the spot. A swelling will be less likely to suffer further injury if the thickness of the blanket or numnah is increased to the greatest extent practicable.

When Pressure must be removed.

If a bald patch is found from which the hair has been rubbed, or if a swelling will not yield to hand rubbing, the pressure of the saddle must be removed from the affected part. This must, of course, be also done in the case of a sore.

Methods of removing Pressure.

There are three methods of removing pressure from the affected part, namely, by :—

(*a*) Folding the blanket ;
(*b*) " Chambering " the panel ;
and, though this is only a last resource,
(*c*) Cutting the numnah.

(*a*) *By folding Blanket.*

The blanket can be folded in several ways—

(1) With a horse of normal shape and condition the following method is recommended :—The blanket is folded lengthways in three equal folds, one end being then turned over 24 inches, and the other turned into the pocket formed by the folds. The blanket is then placed on the horse's back with the thick part near the withers.

Size when folded 2′ 0″ × 1′ 8″
Size when unfolded 5′ 5″ × 4′ 8″

The folding of the blanket may be modified to suit horses of peculiar conformation, and to meet alteration in shape due to falling away in condition or from other causes.

(2) In the case either of a horse which has fallen away in condition or for certain shapes of back, the "channel fold" is recommended. The blanket is folded lengthways in three equal parts, each end being then turned over and folded towards the centre, leaving a channel in the centre. The sides may then be folded two or three times as required to suit the horse's back.

(3) The blanket is folded lengthways double, then widthways double, the raw edges to the off-side and rear.

If the plan of folding the blanket is adopted, the blanket should be so folded for a day or two that a space is left over the affected part, and consequently the greater portion of the pressure removed. But, as this throws a great pressure on other parts, which in their turn will tend to suffer from undue pressure, it should not be done for a day longer than is necessary. The special folding of the blanket will usually answer the same purpose as chambering the panel, and is therefore to be recommended, seeing that it does not entail the careful re-stuffing of the panel.

(*b*) *By chambering Panel.*

The panel of the saddle may be "chambered" by removing a small quantity of stuffing over and round the point which lies directly over the affected part, and stitching the covering of the panel to the backing.

In order to detect the spot on the saddle which is directly over the affected part, wet or put a little colouring matter on it, then, after saddling up and mounting for two or three minutes, unsaddle, when a mark will be left on the numnah. A pin may then be stuck through the numnah in the centre of this mark, and the place thus indicated on the panel. Great care must of course, be taken that the pin is at once removed.

Should the panel be chambered, it should be not done for a day longer than is necessary, for the same reasons as explained in the case of folding a blanket.

(c) *By cutting the Numnah.*

The plan of cutting the numnah should never be resorted to except as a last alternative, because, once the numnah is cut, the piece which is removed can never be satisfactorily replaced. If it is cut, great care should be taken that the raw edge of the numnah does not rub the sore, and moreover, attention should be given all day to girthing, so that the numnah does not move and rub the sore.

Treatment of a Sore.

If the skin is broken and the place becomes a sore, the raw surface should be covered with a piece of lint, upon which boracic ointment has been spread. Failing that, it may be treated with zinc ointment. Any such injury should be at once reported. If the horse must be worked, the wound should be dressed every morning, and the blanket so folded as not to allow any pressure on the spot. The blanket should be put on next the horse's back, and great attention should be paid to girthing throughout the march, so that the blanket may not shift and rub the sore.

Major Eassie's Numnah.

A new cavalry numnah invented by Major Eassie has been recently tried in India with great success.

It involves a new principle. The numnah is fitted with metal plates, and the wooden tree of the saddle rest directly upon them. The saddle and numnah can be kept together by leather runners on the plates, through which the girth attachments pass.

Friction is taken entirely from the back and occurs only on the surface of the plates—the line of least resistance. The plates are so shaped as to fit the back accurately, and they distribute pressure over a large area so that uneven pressure is impossible.

The numnah is open along its central line, and is lifted into the arch of the saddle, so that the spine is not touched, and the spine and withers are thereby protected from pressure and friction.

The cavalry saddle fitted with this numnah can be used in most cases of sore backs without causing further injury.

The same principle has also been applied to pack saddles. Metal plates are interposed between the tree and the stuffed leather panels, and the loads ride on swinging fenders, suspended from the tree, which move freely on the plates.

Harness Injuries.

Injuries due to Neck Collar.

If the collar is too tight, an injury may occur high up on the sides of the shoulder. To obviate this, the collar must be stretched or some of the padding removed. If the collar is too wide, injury may occur at a point below the attachment of the traces to the harness. The remedy is to plug the collar at this point in order to make it narrower. The commonest injury, however, occurs below this and on the front of the shoulder. This may be caused by the collar being either too tight or too loose. If too tight, it may be wetted and stretched so as to open it; if too loose, it may be made narrow by means of strips of numnah.

Horses may, as a rule, be continued in work even with slight collar galls provided that the cause of the injury is remedied. When, however, serious inflammation results, a few days must be allowed for the subsidence of the inflammation. Under no circumstances should any attempt be made to insert any form of pad under the collar, as this is bound to cause injury from localisation of pressure under the pad.

Injuries due to Breast collars and breeching.

Chafes occur as a rule from breast collars which are too narrow and the leather of which is too hard. Breast collars should be bound and sheathed in soft leather without any seams on the side next to the skin.

The breast collar should rest above the points of the shoulder, and the supporting strap should on no account be so tight as to bring pressure on the top of the neck.

Breeching galls are caused by the breeching being too narrow, the leather being too hard and the edges sharp. The leather should be kept soft by soft soap or dubbing. It always tends to get hard from sweat.

Girth Injuries.

Cause of Girth-galls.

In nine cases out of ten, girth-galls and saddle-galls do not come from any fault in the saddle, the girth, or the horse, but from the carelessness of the rider in not looking out and preventing them in time.

Girth-galls are usually caused by the edge of the girth chafing the horse's elbows, therefore men should be careful not to girth too far forward, particularly with horses whose elbows are close to their sides or that are very fleshy below the elbows.

Treatment of Girth-galls.

"The Manual of Horse and Stable Management" states that "with horses that constantly gall, a non-slipping girth should be worn, which may be made by splitting the regulation girth all round into strips about ¼ inch wide, and taking out a very narrow shave ($\frac{1}{16}$ inch) between each two strips, a spreader being attached to keep the strips separate." One of the very wide cord girths fitted to many American and Mexican saddles will be found useful. The Manual further states :—" To work a horse already galled, slacken the girth ; place the surcingle over the fans and round the belly ; take the centre cloak strap, pass it round the girth and surcingle, and draw them together beneath the belly before girthing up. It will be found possible to draw the girth sufficiently far back to avoid injury.

The commonest method, which is usually found very effective, is to fold a piece of sheepskin round the girths.

Another method is to take a strap or string, and passing it round the girth and surcingle, strap or tie it on to one of the dees, say the shoe-case dee, on the side of the saddle.

Girth Swellings.

Girth swellings, either beneath the chest or behind the girth, are produced by too tight girthing. Girths should never be so tight that two fingers cannot be inserted underneath the girth, and when the men are dismounted for any considerable time, girths should be slackened, especially when horses are grazing.

Girth swellings can generally be reduced in two or three days by hand rubbing.

Bit Injuries.

Cause and Effect.

The usual cause of a bit injury is the use of a heavy bit by a man with indifferent hands. A pulling horse is more liable to a bit injury than a horse with a light mouth. The injury when once caused makes a horse pull harder.

A very grave injury to the sockets of the incisor teeth, the tushes and the first molars, an injury possibly involving the total death of a large area of bone, may be present with but slight external evidence. As a rule, however, there is swelling of the bone of the jaw, especially in the case of serious curb injury. Any such injury should be reported immediately for treatment by a veterinary officer.

Prevention and Treatment.

Prevention lies in the direction of using a lighter bit and giving the horse to a man with good hands.

The minor injuries caused by the rubbing of the curb chain should be treated with boracic ointment or vaseline. A leather guard behind the chain will save a great deal of friction on a wound ; it should, of course, be kept very soft. But the best thing is to remove the curb chain altogether until the sore has healed.

Shoeing Injuries.

Forms of Injury.

The forms of injury caused by horses striking themselves with their own shoes are : (1) "Brushing, "(2) "Speedy Cutting," and (3) "Over-reaching."

The position of each of these injuries is shown in Plate 14, on next page.

(1) *Brushing.*

Brushing is inflicted by the inside rim of one shoe striking the opposite foot of the pair, and may occur in either the fore or hind leg.

Many horses only brush when out of condition or when tired by a long journey, while with others it is due to a radical fault of conformation. Young horses that are weak are particularly liable to it.

To prevent "brushing" a feather-edged shoe should be fitted, as shown in Plate 15, Fig. 1, p. 420. The inner arm of the shoe should be raised, but the outside edge of this arm should be well bevelled away under the foot. The foot can even be allowed to project over the shoe, the hoof being rounded off with a rasp. The shoe should be fastened on the inner arm by two nails near the toe, the outer arm remaining unaltered.

If this method fails, a Yorkshire boot, as shown in Plate 15, Figs. 2 and 3, must be worn.

(2) *Speedy Cutting.*

A horse with high action and awkward carriage of the head is particularly liable to this injury.

The injury is caused by the inner rim of one fore shoe striking the other fore leg. It requires immediate attention, inasmuch as a horse which speedy cuts is liable to fall heavily and suddenly.

The best shoe for speedy cutting is one in which, as shown in Plate 16, Fig. 1, the ground surface or inner arm is rounded and a portion of the hoof allowed to project beyond the shoe.

PLATE 14.

Position of injuries caused by shoes.

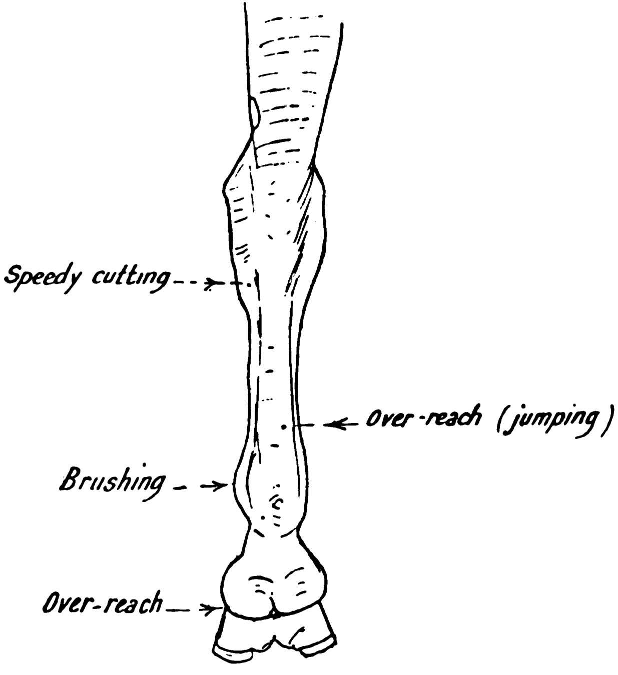

Speedy cutting
Over-reach (jumping)
Brushing
Over-reach

PLATE 15.

Fig. 1.

Left Hind foot shod for "Brushing"

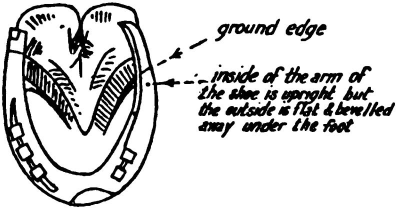

ground edge
inside of the arm of the shoe is upright but the outside is flat & bevelled away under the foot

Fig. 2.

Method of putting on Yorkshire boot

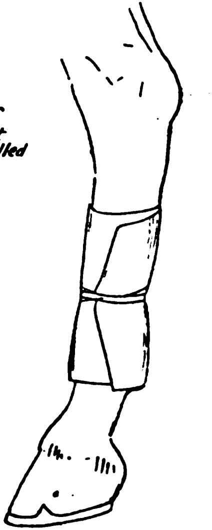


Fig. 3

Yorkshire boot fitted.

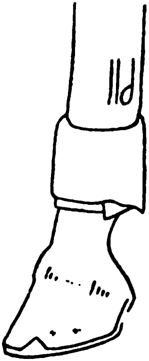


PLATE 16.

Fig. 1.

Left Fore foot Shod for speedy cutting.

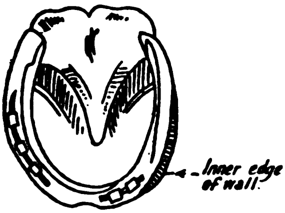

Inner edge of wall.

Fig. 2.

Tip

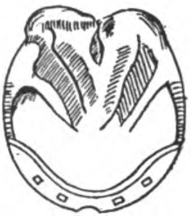


Fig. 3.

Hind shoe to prevent Over-reaching or Forgeing

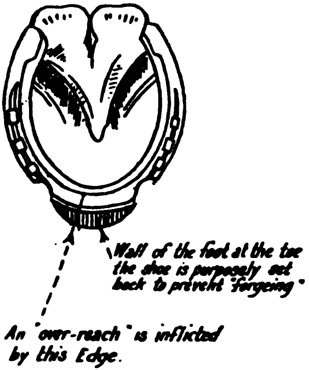
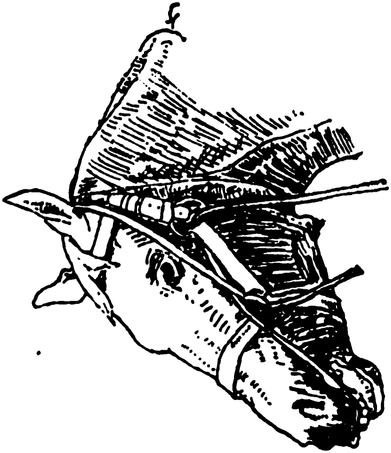
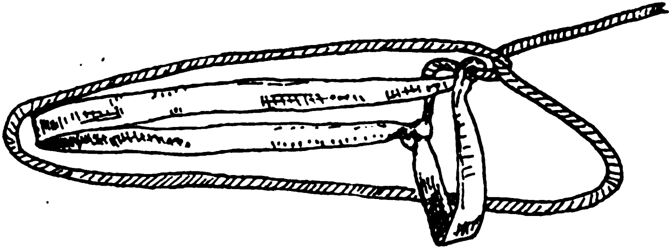

Wall of the foot at the toe the shoe is purposely set back to prevent "forgeing".
An "over-reach" is inflicted by this Edge.

PLATE 17.



Head Stall Twitch on Horses



The halter twitch

If this is not successful, a boot, similar to a knee cap but of solid leather, should in addition be worn to protect the point of injury. Careful bitting, with a view to bringing the head lower, is also to be recommended.

(3) *Over-reaching.*

Over-reaching usually occurs when galloping on heavy ground. The injury is usually situated between the fetlock and the hoof, and is caused by the inner lower edge of one hind shoe striking the fore leg. It may also happen in landing over a jump, but in this case the injury is generally above the fetlock. In very bad cases the outer of the two back tendons of the foreleg may even be severed.

Horses which have long pasterns and also bent hocks are specially liable to this injury.

Forgeing.

Forgeing usually occurs in horses with sprawling disconnected action. This tendency can be lessened if they are kept collected by being made to go against the bit. Many horses only forge when out of condition or tired.

If this remedy is not successful, the hind shoes should be put back on the feet, as shown in Plate 16, Fig. 3, p. 421.

VETERINARY FIRST AID.

Twitch.

A twitch is often used to keep control of a horse while some minor operation is being performed, or to "gentle" a savage or untrained animal.

The twitch shown on Plate 18, Fig. 3, is that commonly used, but this form has the disadvantage that during application the horse is suffering pain continuously.

A better method is that called a "Halter Twitch," described in Captain M. H. Hayes' book, "Illustrated Horse Breeding," see Plate 17, Fig. 1.

In this twitch a half-hitch is made with the free part of the rope of the halter, the loop is passed over the horse's ears, the lower part of the loop being placed under its upper lip and the free end of the rope pulled taut with a jerk when required; at other times the part of the rope passing under the under lip should be kept slack, consequently the horse suffers no pain.

The advantages of this twitch over the ordinary one are:—

(*a*) Easily procured and applied.

(*b*) Does not inflict much pain, and this pain is momentary and not continuous as with the ordinary method.

(*c*) It is not so liable to slip off, and can be kept on for an indefinite length of time.

(*d*) It has a more or less permanent good effect on the horse's temper, and does not make it shy of having its mouth touched.

Another form of the same twitch, the "Head Stall" twitch, is shown on Plate 17, Fig. 2.

Wounds.

Preliminary Steps.

The first step in all wounds is to arrest excessive hæmorrhage, the second is to cleanse the wound and apply a dressing.

1. *Arresting Hæmorrhage.*

Hæmorrhage will either be from an artery or from a vein. If from a large artery, the blood will be pumped out in jerks, and from any artery is always of a bright colour. Hæmorrhage can as a rule be arrested by direct pressure, but if this does not suffice no time must be lost in endeavouring to compress the artery somewhere between the wound and the heart.

If the wound is on a limb, a tourniquet can be applied. For this purpose a handkerchief should be tied round the limb. a stick should then be inserted between the handkerchief and the skin, and twisted round so that the handkerchief is tightened until the hæmorrhage stops. The wound can then be dressed and bandaged. After a time the tourniquet may be loosened and if no hæmorrhage appears it may be removed. The large vessels traverse the inside of the limbs, above the knee and hock, and both on the inside and outside the limbs below the knee and hock.

Hæmorrhage from vessels of the head or body, which are reachable by pressure, is usually arrested easily by direct pressure against the wound.

Hæmorrhage from a vein is as a rule easily controlled by direct pressure.

Dressing the Wound.

Every care must be taken not to infect wounds. They should not be touched with the fingers. The best plan is to swab wounds with tow saturated with tincture of iodine. The tow may be wrapped round the end of a probe or a piece of stick. Plugs used to stop hæmorrhage should be dipped in tincture of iodine. If the finger has to be used, it should be rendered sterile by soaking in tincture of iodine.

When the hæmorrhage has been stopped, the wound should be cleansed by a weak antiseptic solution, such as perchloride of mercury solution (one tabloid to a pint of water) or a solution of Jeyes' Fluid, phenyle, or permanganate of potash, all foreign substances being removed.

The dressing (see p. 427) should then be put on, and, if the situation of the wound admits, a bandage should be applied over a wad of tow soaked in the dressing. But if, owing to the situation of the wound, it is impracticable to apply a bandage, the wound may be dressed and covered with teased-out cotton wool, which will adhere to the wound. It will adhere better if the skin surrounding the lips of the wound is smeared with vaseline.

In wounds of the sole of the foot, pads of tow saturated with this dressing can be kept in position by strips of iron, as shown in Plate 18, Fig. 1, p. 426. Wounds thus protected will remain aseptic for two or three days at a time, even when a

PLATE 18.

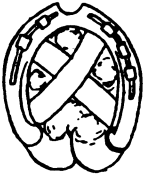


Fig. 1.

Method of keeping a dressing in position on Sole of Foot

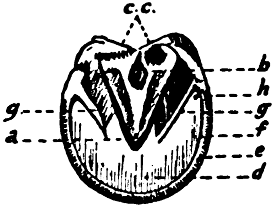


Fig. 2.

Surface of the Foot

a.—point of Frog.
b.—cleft of Frog.
c.c.—bulbs of Frog.
d.—Sole.
e.—Wall.
f.—white line dividing wall & sole.
g.g.—Bars formed by the folding inwards of the wall at the heels
h.—seat of corn

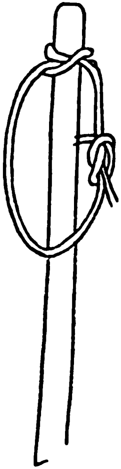


Fig. 3.

A Twitch.

horse is standing in filth up to its coronets. With a dressing not of an oily nature this would be impossible.

For contused wounds or painful abrasions, such as broken knees, heel rope galls, cracked heels, and sore backs, boracic ointment " buttered " on a piece of lint is an effective dressing. In the case of broken knees, and also where possible of cracked heels, etc., the lint should be kept in its place by a bandage. In the case of a sore back, the numnah will keep the dressing in its place.

For all other wounds and for thrush, seedy toe, and suppurating corns, the following will be found a good first-aid rough dressing for wounds on service. It prevents irritation of wounds, over-granulation, and, owing to its oily nature, it is protective (as, for instance, in wounds of the feet), and has the added advantage of keeping off flies :—

Olive Oil - - -	40 ozs.
Turpentine - -	20 ozs.
Creosote - - -	6 drachms

For wounds or abrasions accompanied by swellings, tow soaked in acetate of lead lotion may be applied in thick layers and kept in position by bandages.

Hot Fomentations and Cold Applications.

Moist heat relieves local pain, and is therefore sometimes of value ; but when there is a wound or abrasion accompanying swelling, cold aseptic applications are safer and more effective.

When used to relieve local pain, hot fomentations are best applied by means of a piece of blanket dipped in hot water and then wrung out.

Sutures.

Under no circumstances should sutures be attempted except in professional hands. In nearly every case there will subsequently be swelling of the wound, which will strain or burst the stitches ; and there is the very real danger of septic trouble from absorption of imprisoned discharges. No anxiety need be felt about the ultimate apposition of the wound surfaces, however wide apart or jagged they may be. On the other hand, unskilful suturing not only endangers life from septic complications, but the resulting scars are as a rule much more unsightly than is the case when wounds are allowed to heal without any suturing having been attempted.

Broken Knees.

In the case of broken knees, there may be either abrasions, with more or less swelling due to contusion, or the tendon sheaths may be laid open with escape of synovia, or there may be an opening into the joint, or even fracture of the bones of the knee. In any but the simplest cases professional advice should be obtained as early as possible.

In simple cases, and in all cases where proper advice is not at once forthcoming, the wound should be cleansed with an antiseptic solution ; for example, 1 perchloride of mercury tabloid to 1 pint of water. The wounds can then be covered with a thin compress of cotton wool wadding or tow saturated with the oily dressing mentioned on p. 427 ; the knees may then be bandaged, the horse being tied up to prevent his lying down.

Wounds of the Eyes.

The injured eye should be carefully cleansed with a lotion of boracic acid and water. As much boracic acid should be added as the water will take up. The eye should then be covered with a clean wet cloth, which should be kept in position by bandages. Boric powder can be dusted in at intervals.

Jagged wounds of the eyelid can be kept in apposition by a short sharp pin passed through the edges point upwards, a few threads of tow being wound round the pin.

Fractures.

Fractures which are possible to treat and Method of Treatment.

Bone unites with horses just as readily as with other animals, but the difficulty is to maintain that complete apposition of the bones which is necessary to ensure perfect repair, and unless recovery is absolute, horses are useless for general purposes. It is rarely considered advisable, for instance, to attempt treatment in the case of fracture of the long bones of the limbs, and it is certainly not worth while where a joint is involved. On the other hand, many fractures do very well, such as some fractures of the pelvis, face, and jaws, etc., and split pasterns.

In the absence of skilled advice it is often difficult to decide whether fractures exist or not. If a horse can put any weight on a limb, it is wise to give it the benefit of the doubt and not destroy it.

Pending the arrival of skilled aid nothing can very well be done. (*For method of killing horses, see* p. 441.)

Lameness and Sprains.

Lameness.

This is a difficult subject, requiring special knowledge and experience. The cause is often not at all apparent even to a qualified observer. The following are some of the most obvious causes of lameness: contusions from brushing, over-reaching, sprains, foot injuries, such as corns, bruising of the sole, or a nail which has been picked up, or thrush. Where the cause is not apparent, it is always wise to remove the shoe and search the foot.

If any of these causes are found, they should be treated accordingly.

Cases of " laminitis " sometimes occur when unfit horses are called upon to march. The hind legs are carried far forward in the effort to relieve the fore feet of weight, and the feet are found to be hot. Nothing is gained by removing the shoe, because they are attached to the insensitive horn, but benefit is afforded by standing the horse in running water and by allowing him to lie down as much as possible. A full purgative should be given and a little exercise after the acute stage is passed. Nothing further can be done except by expert hands.

Sprains.

In almost all cases of lameness rest from work is necessary. This is particularly the case with sprains. Sprain of muscle is rapidly and completely repaired because muscles are plentifully supplied with blood vessels, but lowly organised structures like tendons and ligaments take longer to repair and recovery is less complete. Sprains are accompanied by much pain, and, as a rule, there will eventually be swelling of the parts, which will enable the injury to be located. In the beginning hot fomentations will relieve the pain.

In sprains of ligaments and tendons of the limbs continual pressure should be applied by means of thick cotton wool compresses, over which bandages are tightly and evenly laid. This support will be of particular benefit when the exigencies of service render the movement of such cases from place to place imperative.

DISEASES.

General Treatment.

General Signs of Sickness.

Sickness should, if possible, be detected in its earliest stages, and this can be done by watchfulness and attention. Much harm is done by working horses in ignorance of the fact that they are sick. The least difference in temperament, dulness, fatigue due to no apparent cause, "stareing" of the coat, failing appetite, coldness of the ears or legs, accelerated breathing, uneasiness and anxiety are all signs of illness.

If expert advice cannot be obtained, a horse showing any of these signs should not, if possible, be worked, and should be closely watched, in order to detect any symptoms which will lead to a correct idea of the case and to its proper treatment.

If no other horses are obtainable, and if, for instance, the horse is on active service and must be worked, it should be taken at as steady a pace as possible, the rider should continually dismount and walk, and the horse should receive all possible attention on arrival in camp.

The normal temperature of a horse is 100° F. The temperature is taken best by placing the thermometer in the rectum.

In the case of a horse suffering from fever, the increased body temperature will generally be evident if a finger is passed into the mouth.

Nursing.

The importance of providing the best conditions for sick horses cannot be exaggerated. The chief considerations are fresh air, shelter, shade from sun, light warm clothing if necessary, a good bed to lie upon, light, digestible food, hand-rubbing and light bandaging of the legs, and frequent changes of position when weak and unable to rise.

Stimulants.

Stimulants are of value when a horse's ears and legs are cold and there are other signs of failing circulation. Stimulant balls are carried in the farrier's wallet. There is, however, nothing so good or so prompt as half a tumblerful of spirits given in a pint or so of water, the dose being repeated occasionally as required.

Method of giving a Draught.

A draught may be given to a horse by means of a wine bottle, preferably a hock or champagne bottle. The horse's head should be raised by means of a soft rope loop attached to a broom or fork, or "twitch" handle, as shown in Plates 17 and 18 (Fig. 3), p. 426, the loop being placed in the horse's mouth. The lower jaw should be free, as this assists the act of swallowing. The person giving the draught should insert the neck of the bottle inside the cheek and pour out until the mouth is full. Time should be given for the horse to swallow and then more given, and so on.

It is not wise to rely on a man giving a ball to a horse, as it is not uncommon for men to say that it has been given when they have failed to give it. It is safer, as a rule, to administer medicine in the form of a draught, if only for this reason.

1. Non-Communicable Diseases.

Colic.

Colic is often associated with fatigue. A horse that is tired and is in the re-action stage after fatigue, cannot digest food in any quantity, and colic is often the result. It also happens as the climax of prolonged improper feeding and want of exercise. In these cases there is generally impaction of the gut by food.

When there is more than one case of flatulent colic it is safe to suspect the forage.

In the absence of skilled advice it is best to assume that in every case of colic there is obstruction of the bowels. This is relieved by a quickly acting purgative of sufficient strength. For this purpose nothing is so good as an ordinary "physic" (aloes) ball dissolved in a little hot water and made up to a pint with cold water. For an ordinary-sized horse 5 drachms is sufficient; for a large horse 6 drachms; for a pony 4 drachms. If not dissolved first, but given in the form of a ball, valuable time is lost in the dissolving of the ball in the stomach, whereas every half-hour is of importance in colic.

As a rule pain will disappear in from half an hour to an hour after the administration of the draught. To relieve pain a ball containing chloral hydrate may be given. This is carried in the farrier's wallet. A stimulant may always be given with advantage.

If in addition to pain there is a gaseous distention, one of the stimulant balls from a farrier's wallet containing three drachms of carbonate of ammonia may be given with advantage, and repeated, if necessary, after a few hours. When distention is great, professional aid should, if possible, be obtained at once.

Staggers.

Staggers includes any condition which causes an animal to fall suddenly and be incapable of getting up again. The usual causes are pressure of the collar or breast harness on the large vessels of the neck, which produces congestion of the brain, or the effect of the sun combined with work. Treatment—shade from the sun, cold water to head and spine, and keep as quiet as possible.

Debility.

Debility may be due to a variety of causes. It is safe to state that horses in this condition should be excused from work altogether if this course is possible. Liberty to graze and the gentle exercise thus afforded will be all in their favour. It is most desirable to afford shade and shelter, but when loose they will find this for themselves. It is by attempting to work horses in a debilitated condition and by exposing them to extremes of heat and cold, tied up where they cannot help themselves, that the greatest wastage of horses occurs in war.

URINARY TROUBLES.

Over-distended Bladder.

When horses on long-distance journeys are hurried without being halted sufficiently often, it not unfrequently happens that the bladder becomes distended and thus paralysed. This does not occur in the case of mares. The symptoms are slowing of the pace and awkwardness of gait, and after a time the horse is noticed to take shorter steps with the hind legs, and finally to break out in a profuse sweat. This condition is frequently mistaken for colic. The nature of this trouble may, however, be ascertained for certain by passing the hand into the rectum, when the distended bladder can be felt beneath the hand. If unrelieved, there is the possibility of rupture of the bladder.

Horses in this state will often succeed in emptying the bladder unaided if led into long grass. Failing this, a gentle handling of the bladder through the rectum will, as a rule, overcome the spasm of the neck of the bladder. If this is unsuccessful, an enema of warm water should, if possible, be given and the belly and sheath vigorously hand-rubbed. Stimulants will aid in relaxing the muscular spasm.

The fact that this distressing condition may occur emphasises the necessity for frequent halts and for observation on the part of men that their horses take the opportunity of staling.

Asoturia.

Asoturia is another condition which is characterised by profuse sweating, paralysis of the hind quarters and the passage of dark blood-coloured urine, and occurs when horses out of condition have been too highly fed and then subjected to exertion. If this condition is not recognised at an early stage and the horse is made to continue the journey, complete paralysis will result, accompanied by insensibility. Recovery is then generally hopeless.

In the first stages a full dose of aloes or any available purgative of sufficient strength should be given at once, and the whole body vigorously massaged.

If possible, the horse should be kept upon its legs, and at the same time care should be taken that there is no retention of urine. If there is, endeavour should be made to empty the bladder in the manner already described.

Constipation.

In the horse constipation is usually associated with jaundice, and occurs when the animals are kept without sufficient exercise in close stables. A full does of aloes, according to the size of the horse, should be given and a bran diet resorted to.

Diarrhœa.

Diarrhœa is, as a rule, an effort of nature to get rid of irritating material due to imperfect digestion of food. It is unwise to check it by giving opiates, chlorodyne, etc. A moderate purgative of aloes or linseed oil should be given and the diet restricted to bran and hay. When diarrhœa is excessive, stimulants may be given with advantage, the legs being hand-rubbed and bandaged, and warmth ensured by clothing.

Profuse diarrhœa frequently occurs as the result of working horses which have been recently at grass. This is particularly the case with imported horses in hot climates.

Congestion of the Lungs.

Congestion of the lungs may occur in an acute form when unfit horses are subjected to violent exertion. The breathing is rapid and laboured, the nostrils are widely distended, often with a flapping movement, and the elbows are held wide apart. The girths should be loosened and the head turned to the wind.

Congestion of the lungs occurs also as a result of living in foul air, as in close stables or more particularly on board ship. First aid consists in instant removal to fresh air. As the condition is usually associated with digestive derangement—evidenced by jaundice to a greater or less degree—a prompt purgative should be given.

Heat Apoplexy.

Heat apoplexy occurs as a result of foul air associated with heat, as on board ship. The nostrils are widely distended, the eyes staring with pupils dilated, the fore legs wide apart and the flanks heaving. This condition may culminate in frenzy. The same first-aid treatment should be given as for congestion of the lungs, in addition to cold douches to the head.

Heat apoplexy also occurs in the open air, where horses, particularly when they are unfit, are subjected to extreme exertion in intense heat, and more especially in humid weather.

Exhaustion.

Horses apparently incapable of going a step further may be got into camp and recovered by giving them stimulants in small quantities frequently repeated, and by giving them time to recover and assisting their movements. Cases all but hopeless may be revived by strychnine given hypodermically but, needless to say, such cases require professional treatment.

Thrush.

Thrush is a disease of the cleft of the frog, in which there is an offensive discharge. After cleaning the cleft of the frog the oily creosote dressing (p. 427) should be applied by means of a little tow pulled backwards and forwards gently and pressed into the depth of the cleft, where is should be left until the dressing is replaced each day.

Mud Fever and Cracked Heels.

Mud fever and cracked heels result, as a rule, from washing the legs and imperfectly drying them. Mud fever was formerly very common owing to the prevalence of the practice of washing horses' legs. Nowadays mud is left on until dry, and then brushed off. Compresses saturated with lotion of acetate of lead—about a teaspoonful of the crystals to a wine bottle of water—will relieve the pain and inflamation. When inflammation ceases, oxide of zinc ointment can be applied.

2. Diseases of a Communicable Nature.

General Precautions.

Many diseases are directly communicable, either by contact of diseased with healthy animals or by discharges or eliminations from animals in advanced stages of these diseases. The intelligent co-operation of all concerned will always greatly assist the efforts of veterinary authorities to prevent, limit, or suppress diseases. Speaking generally, it is important—

(1) To avoid infected camps or units ;

(2) To be careful in admitting animals from unknown or doubtful sources to free contact with horses belonging to units :

(3) To be aware of the prevailing diseases as well as their prominent symptoms ;

(4) If any of these diseases do occur, to endeavour to detect them in their very earliest stages ;

(5) To take every opportunity of getting expert advice in cases of the least suspicion ;

(6) To carry out at any inconvenience the isolation of infected or " in-contact " cases.

The following are some of the most important diseases directly communicable :—

Strangles.

Strangles is essentially a disease of young horses. The prominent symptoms are : yellow nasal discharge, painful swelling between the jaws, and fever.

The disease is very contagious, since the discharges infect, for instance, forage, etc., which may be eaten by healthy horses. A place, such as a stable, ship, or a truck, remains a centre of infection for an indefinite time unless disinfection is thoroughly carried out.

Strangles takes, roughly, three weeks to be declared, and in some cases longer. A batch of young horses cannot consequently be considered free until at least three weeks have elapsed from the date of the last case. The importance of proper arrangements for young horses so as to facilitate the earliest detection of cases of this disease is obvious, and it is particularly the case when, for example, young horses are shipped without a proper period of quarantine.

The disease is also grave, because, like contagious pneumonia, it is followed in a very large percentage of cases by roaring and other more or less permanent sequelæ.

Pending the arrival of skilled aid, such cases should be isolated effectually, and should be put under the best conditions.

Pneumonia and Influenza.

Pneumonia is invariably a secondary affection occurring as a complication in other disease conditions. It is associated only with life in stables. Want of air and proper exercise give rise to a condition of vitiation of the blood and alteration in the organs in general and of the lungs in particular which allow of the invasion of the lungs by the germs of pneumonia, always present in the air passages but otherwise harmless. Associated with what is popularly known as influenza in the horse—in reality it is the influenza itself—it is contagious. Pneumonia is common in young horses.

The symptoms are fever, rapid breathing, etc., and there is always a disinclination to lie down.

Pending the arrival of skilled aid, suspected cases should be isolated and placed under the best conditions as to surroundings, nursing, etc. Pure air is essential.

Glanders.

Glanders is a disease of horses, mules, and donkeys; it is variable, but generally acute in the ass, sub-acute in mule, chronic in horses.

The symptoms of glanders are similar to those of strangles, but the discharge is sticky, and the swelling between the jaws is not painful. In the latest stages there are ulcers inside the nose, and often sores on the skin in chains. It is easily communicable by the discharges, which soil mangers, posts, etc. It is communicated by horses licking the discharges, or eating soiled forage, etc. A horse may suffer from glanders for many months while being apparently healthy. When once it is established in the system it is inevitably fatal.

Glanders is communicable to man, and is equally fatal. In man it is less uncommon than is generally supposed.

Men who are attending horses which are suspected to be suffering from glanders should be particularly careful to avoid handling them. Infection may take place, for instance, through a sore in the hand, or by men eating food with hands soiled by the discharges.

A horse declared to be suffering from glanders is invariably destroyed, and great care is taken to burn all bedding, forage, clothing, etc., with which it can have come in contact. The carcase may be buried or burnt.

With the facilities for detection in the latent stage afforded by the "Mallein" test, and by co-operation on the part of officers of mounted corps, this disease should not prove so troublesome or so costly as it has in nearly all campaigns in the past.

Epizootic Lymphangitis.

Epizootic lymphangitis is a disease resembling the skin form of glanders; that is to say, there are often sores on the skin in chains. It is due to a fungus, and is very communicable. It has a prolonged latent period—two months, or possibly more. Suspected cases should be isolated and reported for verification.

This disease is not communicable to man.

Mange.

Mange occurs in horses, mules, and asses, and is intercommunicable between them. It is found in three forms, which are due to three distinct varieties of the mange parasites. In the worst—or "Sarcoptic" form—it appears on the withers and body in round patches and gradually spreads over the skin. In the early stages it may be mistaken for ringworm, or for infection by lice. The horse invariably "nibbles" when rubbed, but rarely in the first stages rubs himself. There is intense itching. In this form only, men attending on the horses often become itchy about the arms and body—a fact which will assist in its recognition.

A more common form of mange affects the upper part of the neck first and then the inside of the limbs. In this form the horse rubs himself.

A third form of mange affects the legs only, and is not contagious to anything like the same degree. In this form the horses bites the place.

In any of the three forms a good first-aid dressing can be made by thoroughly mixing 1 part of creosote in 40 parts of oil or mixing sulphur and oil; or, failing this, ½ lb. of ordinary chloride of lime in a bucketful of water. The horse should then be scrubbed all over with the dressing.

It is of the first importance to have suspected cases verified by exact methods, and to obtain and carry out rigidly expert advice with a view to limiting the disease to the first cases, and to prevent re-infection by approved methods of disinfecting.

Ringworm.

The circular variety of ringworm is easily recognisable, and yields at once to treatment by tincture of iodine or ointment of corrosive sublimate (3 grains to the ounce). Failing other remedies, soft soap only may be used

A more troublesome variety occurs in less defined patches, particularly on the withers.

In all doubtful cases early resort should be had to professional advice. Care should be taken in the meantime to disinfect saddlery and harness by scrubbing it thoroughly with Jeyes' Fluid, or some other similar disinfectant.

Lice.

First aid treatment for lice should be confined to washing with a weak solution of Jeyes' Fluid. They are easily distributed by contact or by grooming kit.

Diseases peculiar to Localities and Indirectly Communicable by Means of Biting Flies, Ticks, etc.

Here, again, the co-operation of officers of mounted units can do much towards the limitation of disease. Such diseases as, for example, surra (India), epizootic paralysis (India), horse sickness (South Africa), biliary fever (malaria of equines in tropical and sub-tropical climates), epizootic ophthalmia (Africa, etc.), big head (*osteo porosis*) (Africa, etc.), may all be avoided to a greater or less extent by precautions founded upon a knowledge of their nature and the ways in which they are propagated.

Method of Destruction in Hopeless Cases.

In obviously hopeless fractures destruction should be resorted to without delay. A horse is best destroyed by shooting with a revolver or rifle, or by means of the Humane Cattle Killer now supplied for this purpose. The revolver or rifle should be held within an inch of the forehead, at the point where the hair curls in a whorl. Below this the brain may be missed altogether.

The Best Method of Shooting a Horse.

When a Humane Cattle Killer is not available, the best method of shooting a horse is as follows :—

Use a pistol or an ordinary shot gun for choice. If obliged to use a rifle, take care that there is no one standing behind the animal as bullets are apt to come out and go some distance. Stand close up to the animal, with the pistol or gun almost touching its forehead, held at right angles to the head and the centre of the forehead, well above the level of the eyes, just below the place where the lowest hairs of the forelock grow. The animal's head can be brought to a convenient height by offering it a handful of food. The animal will not fall forward but will sink gently downwards without a struggle.

Disposal of Dead Animals.

Carcases of dead animals should never be left about, as they are a source of great danger to all troops. They should always either be buried whole or else burnt. Litter should be burnt over ground where the discharges from diseased cattle have fallen.

PRACTICAL SHOEING.

The Author is indebted to Mr. J. McRae, late Farrier Corporal-Major Royal Horse Guards, for much of the information on Practical Shoeing contained in this portion.

The Horse's Foot.

When the foot is on the ground the part which is visible is named the wall, subdivided for the purpose of definition into the toe, outside and inside quarters, and heels, as shown in Plate 18, Fig. 2, on p. 426. When the foot is picked up, the sole, frog, and bars are seen. The frog is subdivided into the point, cleft, and bulbs.

The wall is composed of tough and hard horn, which is longest and strongest at the toe, and gradually becomes thinner and shorter towards the heel. In a well-shaped foot, the angle from the coronet to the ground at the toe would be from 45 to 50 degrees.

The whole structure of the foot is elastic; it contracts when off the ground, and expands when on the ground.

The horn of the sole grows of sufficient thickness to protect the sensitive foot; it then shells off in dead flakes, and is continually being replaced.

The horn of the frog is softer and more elastic. The frog keeps the heels apart, prevents concussion, and gives the animal a better foothold. It also shells off, and is being continually replaced.

Machine and Hand-made Shoes.

The pattern of shoe used in all branches of the service is the concave shoe, *i.e.* wide on the upper surface and narrow on the ground. Usually there is one clip only on the fore, and two on the hind shoe; but on the hind shoes of draught horses one clip only is used.

For convenience of reference, the sizes of shoes, fore and hind, are numbered from 1 to 8, and nails suitable for each size are issued with them. Sizes 1 to 4 would usually be suitable for Mounted Infantry cobs; sizes 3, 4, and 5, for Light Cavalry; sizes 4, 5, and 6, for Heavy Cavalry and for Horse and Field Artillery; and sizes 6, 7, and 8, for Transport animals. Machine-made shoes have the advantage that they can be fitted cold on to the feet, the smaller sizes being easily altered when cold to fit differently shaped feet, although the larger sizes are not quite so easily altered.

The disadvantage of the machine-made shoe is chiefly that the pitch or angle at which the nail holes are punched is the same from toe to heel, as shown in Plate 20, Fig. 1, no allowance being made for the slope of the different parts of the foot.

In a shoe in which the holes are properly made, the pitch of each nail hole should correspond with the angle of that part of the foot where it is to be placed, as shown in Plate 20, Fig. 2; this makes the nailing on quite easy, with much less strain on the foot. The fullering shown in Plate 20, Fig. 3, is of no practical value, and weakens the hold which the nail head has on the shoe.

The quality of the iron of a machine-made shoe is soft and, weight for weight, does not wear so long as that of a hand-made shoe.

Principles of Shoeing.

The principles to be aimed at in shoeing are to protect the foot and give the animal as natural a foothold as possible.

The wall should be lowered with the rasp until it is level with the sole at the junction of the wall and the sole, and if possible it should be lowered at the heels to such an extent as to allow of the ground pressing on the frog when the shoe is fixed. It is well to leave the sole and frog alone, or only to trim those which are exfoliating.

The shoe should then be fitted to the foot so as to have a level and equal bearing from toe to heel. It should fit exactly to the outer edge of the wall, being slightly fuller at the heels. The foot when fitted with the shoe should have the appearance of that shown in Plate 19, Fig. 1, p. 445, and *not* that shown in Fig. 2, where the foot has been spoilt by shortening or "dumping."

When the wall has been lowered with the rasp so as to make it level with the sole at the junction of the wall and the sole, but not before, the easiest method of fitting a shoe is to place the hot shoe on the foot, when any unevenness can be easily detected and remedied. The foot must not be burnt to fit the shoe, but the shoe must be made to fit the foot.

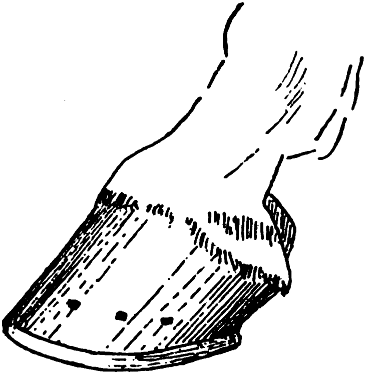
Having once obtained a level bearing, the foot should be left alone. The shoe may for the sake of appearance be filed, but this is not necessary. Since the horn is strongest round the toe and quarters, the nails should be driven in at those places and not at the heels; they should also be driven in sufficiently high to hold the shoe on until it is worn out. The great danger, however, in driving nails is going too deep and wounding or pressing the sensitive foot. If nails are driven too high, an unnecessary length or section of horn is ruined, while if driven too low, the horn is liable to give way and shoes are lost. The happy medium lies between the two. Since driving in nails weakens the horn, the fewer nails used the better. Five well-placed nails are sufficient to hold a shoe on to an ordinary troop horse.

In clenching nails, a small nick should be made in the horn below the clench in order to embed it. Clenches should be short, because they are then stronger and not so apt to rise. The outside of the wall, when a shoe fits, requires no rasping. The clenches may be smoothed over, but should on no account be weakened. The evil of rasping the outside of the foot is that it takes away the outer covering of varnish, allowing the natural moisture to escape, thereby weakening the horn and causing it to become brittle. When fitting the shoe to the foot no more horn should be cut away than is absolutely necessary in order to fit in the clip, which should be tightly hammered down, as shown in Plate 20, Fig. 4, p. 446.

PLATE 19.

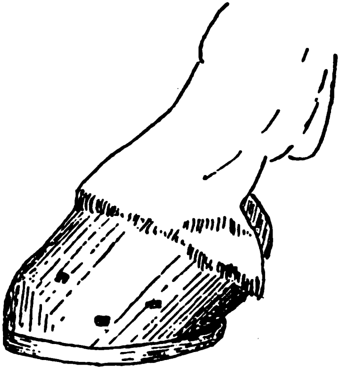
Good and Bad methods of shoeing

Fig. 1



A well shod foot

Fig. 2.

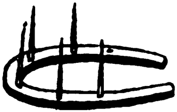


A foot badly shod and spoilt by shortening or "dumping"

Plate 20.

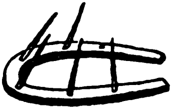
Different forms of Shoes

Fig. 1.



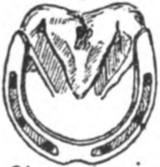
Machine made shoe

Fig. 2



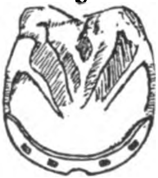
Hand made shoe

Fig. 3.



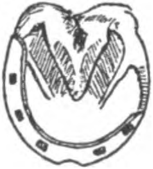
Shoe showing fullering

Fig 5.



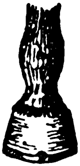
Tip

Fig. 6.



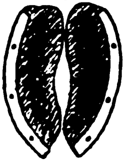
3/4 Shoe

Fig. 4



Clip on Fore Shoe

Fig. 7.



Shoe for Oxen

Shoeing on Active Service.

Every rider should examine his horse's feet at each halt. Clenches that have risen should not be hammered down, but should be replaced by a new nail, because the old nail may have broken.

When short of farriers, horses with good feet can be allowed to go without shoes when their feet are long, the sharp or ragged edges of the wall being rounded off with a rasp. The old shoes should be kept for further use when the feet are worn down. In this way the expenditure of shoes, nails, and labour is reduced to a minimum. As an alternative, horses may be shod with tips only, since it is the toe that wears away on a long march.

When horses stand for any length of time on wet ground their feet expand and the nails get rusty, and are accordingly more likely to break. If the country is rough or the roads hard and the shoes cannot be removed, it is a good plan to draw two old nails out of each shoe and replace them by fresh nails. This will save many shoes from being lost on the march.

When it is necessary to use a forge, and coals are not available, the charred ends of wood collected from the camp fires can be used. If neither a forge nor an anvil is available, the nave or tyre of a wagon wheel can be used, or, failing these, even a tree root or large stone.

In addition to the usual shoeing tools, a light shoe, jointed at the toe so as to fit any foot, should be carried for temporary purposes. One or two bandages, a piece of blanket, string, a Yorkshire boot, and a pair of forceps will be found very useful. The forceps are especially useful for removing thorns or small splinters of wood from the frog, coronet, or fetlock.

Shoeing Mules.

The foot of the mule is composed of harder and denser horn than that of the horse, and does very well without shoes in places where the roads are not too hard or wet. The transport and battery mules of Major-General H. O. C. Plumer's Column of Rhodesian Troops did well without shoes, even though they did a great deal of marching over rough country. There was, in fact, not a single case of foot soreness. Where, however, mules are in constant work in and near towns on hard roads, or if the weather is very wet, they require shoeing.

Mules are shod on the same principles as horses.

Shoeing Oxen.

If oxen are in constant work on hard roads, or if the weather is very wet, they may have to be shod. The easiest way of effecting this is to cast them by tying all four legs close together and throwing them over on to soft ground.

The form of shoe which should be used is that shown in Plate 20, Fig. 7, p. 446.

Different Forms of Shoes.

In addition to the shoes which have been described in the preceding pages, the following may often be found useful :—

Shoe for Thrush.

The best form of shoe for thrush is a tip, as shown in Plate 20. Fig. 5, p. 446. The advantage of this form is that the heel and frog get ground pressure and, as a rule, become healthy in consequence.

Shoe for Sandcrack.

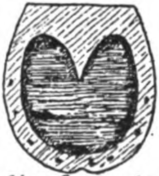
The most successful form of shoe for sandcrack is a bar shoe, *i.e.* one turned in at both heels and welded, as in Plate 21, Fig. 1. This shoe, being a solid ring of iron nailed to the foot, prevents expansion, and if the pressure at the bottom of the crack which tends to force the crack open is taken off, a horse will generally go sound.

The same form of shoe answers well after laminitis or any structural diseases of the foot.

PLATE 21.

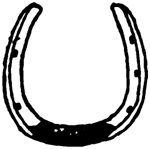
Different forms of Shoes

Fig. 1.



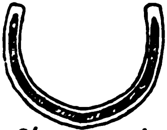
Shoe for Sandcrack

Fig. 2



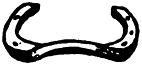
Shoe for stumbling

Fig. 4.



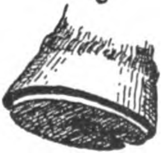
Charlier Shoe

Fig. 3.



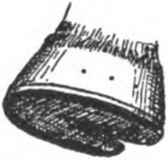
Shoe for stumbling

Fig. 5.



Foot prepared for Charlier Shoe

Fig 6.



Foot shod with Charlier Shoe

Shoe to prevent Stumbling.

A shoe which is useful in reducing the liability to stumble is one which is very thin round the toe and is turned up in front, as shown in Plate 21, Figs. 2 and 3, p. 449.

Charlier Shoe.

The Charlier shoe, as shown in Plate 21, Fig. 4. p. 449, is a narrow rim of steel let into the wall of the shoe so that the shoe, sole, and frog are level on the ground. It is excellent as regards principle, but requires more skill in fitting and putting on, and does not answer on a weak or thin-soled foot.

Figs. 5 and 6 show the foot prepared for this form of shoe and the shoe on it.

Shoes for Snow.

The form of Snow shoe used by the Life Guards is shown on Plate 22, Fig. 1, and that used by the Norwegian Cavalry on Plate 22, Fig. 2.

Roughing for Frosty Weather.

The most effective manner of roughing a horse's feet to secure a foothold on a frozen road or on a wooden or asphalte surface, is to drive frost nails in the heels of hind shoes only.

Screw points can also be used, the shoe being drilled and tapped ; the objections to these are, that they are much more expensive, and take very much longer than nails to fix ; it is necessary also when the points are unscrewed and taken out, when no longer required, to plug the drilled holes with wood or tow.

PLATE 22.

SHOES FOR SNOW.

FIG. 1.

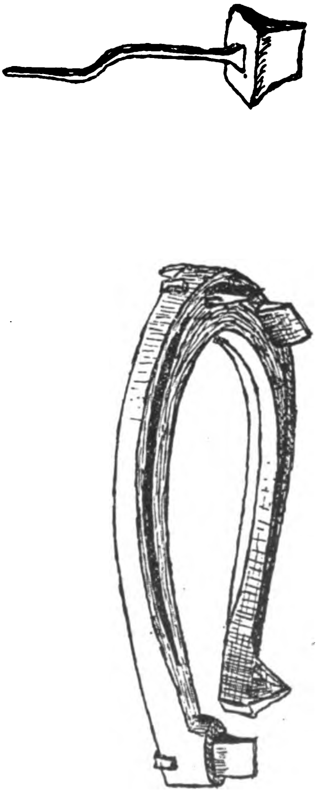
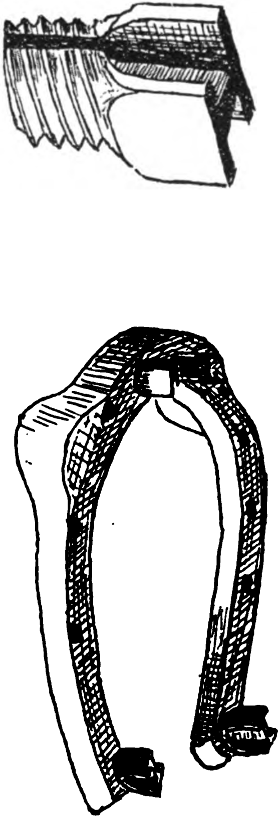


FIG. 2.



PART XI.

TRANSPORT.

TRANSPORT BY RAIL.

Preparation for Entrainment.

Reconnaissance of a Railway.

For points to note in the reconnaissance of a railway, see pp. 128–135.

Accommodation required for Different Units.

The approximate accommodation required for different units is given in the tables on pp. 473–476, 480–484.

Marking Carriages, etc.

Before the arrival of the troops at the station, an officer and a non-comissioned officer from each unit which is to be entrained should proceed to the station, ascertain the platform accommodation (as to which see pp. 469, 478), and, in concert with a railway official, mark on the footboard of each passenger carriage with a piece of chalk, and on the sides of the cattle-trucks and horse-boxes, the troop, battery, or company allotted to them, as well as the number of men or horses which each will hold.

For animals the bottoms of cattle-trucks and horse-boxes should not be less than 1½ inch thick, while for carriage-trucks for guns and wagons they should be at least 2 inches thick.

Disinfecting Cattle-trucks.

Cattle-trucks should be disinfected after each batch of horses. Washing and spraying with disinfectants, besides being inadequate to destroy the germs of disease, make the trucks slippery, while whitewash is of no value and only serves to render disinfecting more difficult. The most thorough method of disinfecting is to use painters' lamps and go over the interiors of the trucks inch by inch with the driven flame. The floors of the trucks, after being disinfected, should be strewn with sand or well-broken cinders, but not with straw.

At any base where horses are continually being entrained, it will be found best to keep a small gang of men continually employed in disinfecting trucks.

Baggage.

As a rule, all baggage belonging to the troops who are to be entrained should be sent on and loaded by a fatigue party before the troops arrive at the station. The trucks containing the baggage should be clearly marked on the sides, showing to what troop, battery, or company they belong.

Marching to Railway Station.

Arrangements for a large body of troops to travel by rail require to be most carefully made, so as to avoid the risk of columns crossing one another on the way or blocking the entrance to the station.

All the approaches to the station should be kept clear, and the general public should not be allowed to congregate in the station or its vicinity.

It is a great advantage if there is some large open space, such as a square or gardens close to the station, in which the troops can halt for 30 minutes or so before entraining. A good supply of drinking water should be laid on in this open space and latrines provided.

Time of arrival at Station.

Speaking generally, troops should arrive at the halting place outside the station from 1¼ to 1½ hours before the scheduled time for the departure of the train; this will allow 30 minutes' halt and ¾ to 1 hour to entrain, according to whether they are infantry or mounted troops, but care should be taken that they do not arrive too soon, since this not only blocks up the station and its approaches, but tends to tire the men. If the baggage has been loaded before the troops arrive, the time can be proportionately reduced.

Entrainment.

ENTRAINING INFANTRY.

On arrival at the station each company should be told off into sections, according to the size of the compartments into which the carriages are divided. For ordinary compartments 8 is the usual number. When this has been done, the battalion should be marched on to the platform in fours, halted and turned towards the train. Sections are then told off to compartments and the men ordered to get into the train.

When the men are in the carriages they should stow away kit-bags, cloaks, etc., under the seats, their accoutrements in the racks overhead, their arms being either kept in their hands or placed in the racks, but never on the floor.

Once the men are in the train, they are on no account to get out again unless ordered.

If required for the loading of baggage or any other purpose, fatigue parties should then be told off, leaving their arms and accoutrements in their carriages.

Silence must be observed from the time the men enter the station until the train departs. The bugle-call "Fall-in" should be sounded when the train is ready to proceed.

All men should be in the train 5 minutes before the scheduled time for departure.

Time required to entrain Infantry.

Half a battalion of infantry, with its proper proportion of regimental transport, will, approximately, fill one train. They should be entrained in about 40 minutes.

Five minutes only should be required to seat the men from the time they march on to the platform.

ENTRAINING CAVALRY AND MOUNTED RIFLES.

On the arrival of a cavalry regiment at the station the men should dismount, and place their arms and accoutrements on the ground, in the same order as they stood in the ranks. They should then be told off, so many to each compartment. For ordinary compartments 8 is the usual number.

Horses should usually be entrained with saddlery or harness on, unless the journey exceeds six hours in duration. If it exceeds six hours, the men, after depositing their arms, should unsaddle their horses and pack the saddles in corn sacks, laying them in front of the covered vans in which the saddlery and harness will be conveyed. The sacks are packed in the vans by a N.C.O. and two men detailed for the purpose. A label with the man's name should be tied on to each sack.

During journeys where the saddles are left on, stirrups should be crossed and girths slackened. Bits are invariably left in when horses are carried in Stock Cars, it being the opinion of veterinary officers that by so doing there is less likelihood of injuries arising from biting. In Canada it is the general custom to leave the bits in the horses' mouths during all railway journeys; this is not, however, usually done in this country except on short journeys.

The horses should be told off into sections of 7–10, according to the capacity of the horse-trucks. It is laid down that the more tightly horses are packed the more safely will they travel. The sections after being numbered from the right of each squadron should then file from the most convenient flank, each halting opposite the truck bearing the number of the section.

A quiet horse should be led in first, the remainder following in succession.

A restive horse can often be backed in, or a rope can be passed through the iron loop on the side of the truck, round the horse's quarters, and through the iron loop on the other end of the truck. If a man hauls on each end of the rope and one at the halter, the horse is bound to go into the truck. An alternative and better plan is for one man to haul at the halter and two farriers to clasp hands behind the horse's buttocks and force him into the truck.

Horses should be led into the trucks unhesitatingly and in a continuous file, the head-ropes being held slackly. On entering the trucks they should be taken to the right or left. It is laid down that the horses' heads should as a rule be left free. They should be placed so as to face away from the second line of rails during the whole or the greater part of the journey, since horses are easily frightened by passing trains and engines.

When all the horses of a section have been put in, the men should at once return to where they have deposited their arms and accountrements, put them on and fall in, after which they will be ordered to get into the train. Each section must be cautioned to remember the number and position of the truck containing its horses, and must be prepared to fall in opposite that truck, when ordered to detrain.

Time required for entraining Cavalry.

A squadron of cavalry should with practice entrain in as little as 20 minutes, but with troops who have not been practised from 45 to 60 minutes must be allowed.

Foreign method of entraining Horses.

The usual method of entraining horses on the Continent is that shown in Plate 23. The men then travel in the space in the centre of the wagon. The horses can, of course, be easily fed and watered *en route*.

PLATE 23.

CONTINENTAL METHOD OF ENTRAINING HORSES.

FIG. 1.

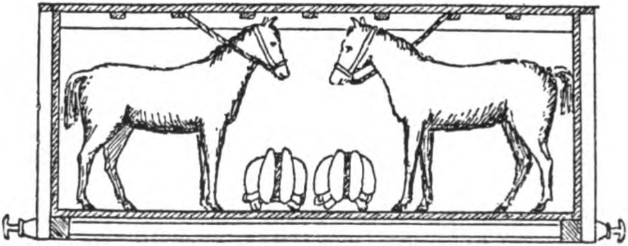
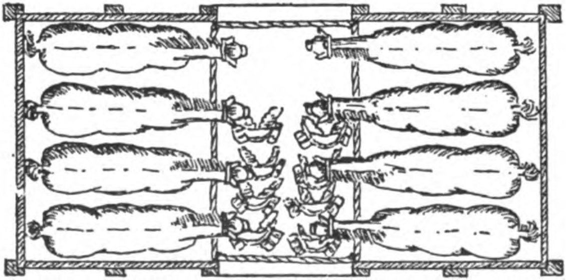


FIG. 2.



Few, if any, of the covered railway wagons in use in the United Kingdom are suitable for carrying horses in this way.

ENTRAINING ARTILLERY, R.E., AND A.S.C.

On the arrival of the battery or company at the station it should be drawn up in the nearest convenient spot. The men should take off their accoutrements and deposit them in some convenient place.

For a journey of less than six hours the horses will usually be entrained with their harness on, but their bits out, stirrups crossed, and traces carefully secured. But on a longer journey all their harness will be removed, and conveyed in covered vans.

The horses will then be told off into sections according to the capacity of the trucks, and each section will be filed to its truck and entrained in the manner laid down for cavalry on pp. 455, 456.

The gunners will assist the drivers in loading the horses, and afterwards the whole of the men will proceed to entrain the guns, etc.

In loading the guns, wagons, etc., trucks which are made for loading from a dock should be used. When the ends of these trucks let down and meet, or where "loading boards" are available for bridging the space between the trucks, the gun-carriages may be run on in a few minutes. Trucks having sides letting down come next in point of convenience, and lastly, low-sided trucks ("King's Regs.," par. 1446). When loaded from a dock, gun carriages, except those of the Heavy Brigade, must be run on the truck unlimbered and the wheels well lashed afterwards.

According to "Field Artillery Training, 1908," in loading guns and carriages, the general points to be attended to are :—

"To distribute the load evenly over the floor, and, if any of the flooring planks are rotten, to put a sleeper across them under the wheels. The minimum thickness of floor should be 2 inches."

"To see that the points of poles or shafts do not stick up so that they would strike against bridges, etc., as would usually occur if they were more than 9 feet above the floor of the trucks."

"To lash the wheels nearest to the ends of the trucks securely to the cross-bars or to false buffers or to rings by a rope, which is also given a turn round the axle of each pair of wheels to prevent them shifting with the jerks of the train."

LOADING GUNS, LIMBERS AND AMMUNITION WAGONS.

The following table gives the minimum length of trucks required for carrying 4, 3, and 2 pairs of wheels respectively; the various combinations being also shown.

HORSE AND FIELD ARTILLERY.

Plate No.		Minimum length of truck. ft.	in.
	4 pairs of wheels.		
24, Fig. 1.	2 guns, 2 wagon bodies	21	0
,, Fig. 2.	4 limbers	18	6
25, Fig. 1.	2 limbers, 2 wagon bodies	18	6
,, Fig. 2.	1 gun, 2 limbers, 1 wagon body	21	0
	3 pairs of wheels.		
26, Fig 1.	1 gun, 1 limber, 1 wagon body	15	6
,, Fig. 2.	2 limbers, 1 wagon body	15	6
	2 pairs of wheels.		
27, Fig. 1.	2 guns	15	6
,, Fig. 2.	1 gun, 1 limber	12	0
28, Fig 1.	1 limber, 1 wagon body	12	0
	HEAVY ARTILLERY.		
	1 4·7 gun and limber	21	0
	3 limbers or wagon bodies	21	0
	TRANSPORT.		
28, Fig. 2.	1 G.S. wagon	12	0
29,	1 G.S. wagon, 1 limber, 1 wagon body or 1 cart	21	0

Suitable methods of loading these combinations are shown in the following Plates.

PLATE 24.

FIG. 1.

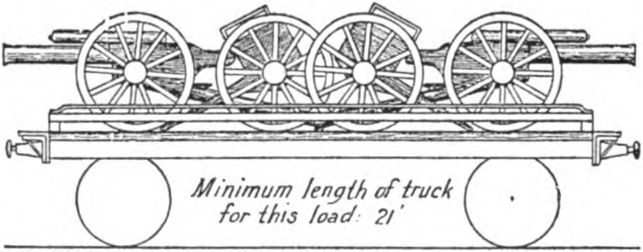

Minimum length of truck
for this load: 21'

FIG. 2.

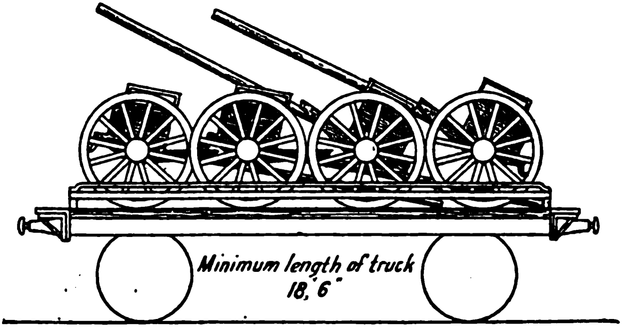

Minimum length of truck
18,' 6"

PLATE 25.

FIG. 1.

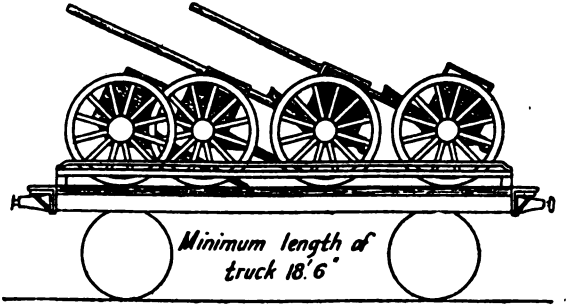

Minimum length of truck 18'6"

FIG. 2.

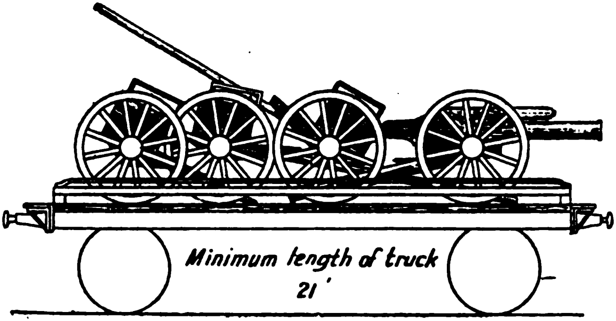

Minimum length of truck 21'

PLATE 26.

FIG. 1.

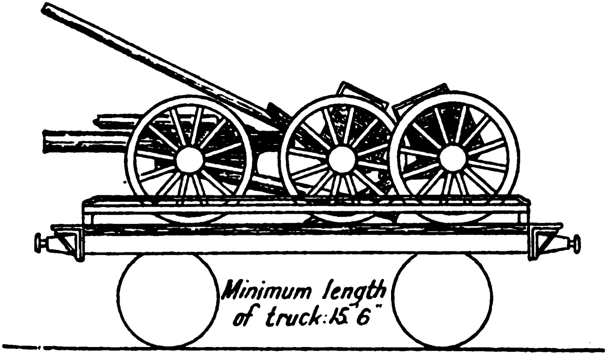

Minimum length
of truck: 15' 6"

FIG. 2.

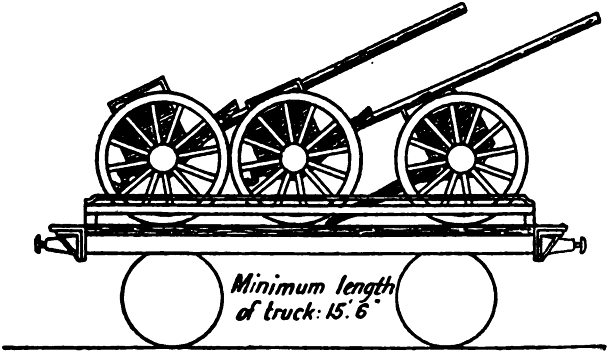

Minimum length
of truck: 15' 6"

PLATE 27.

FIG. 1.

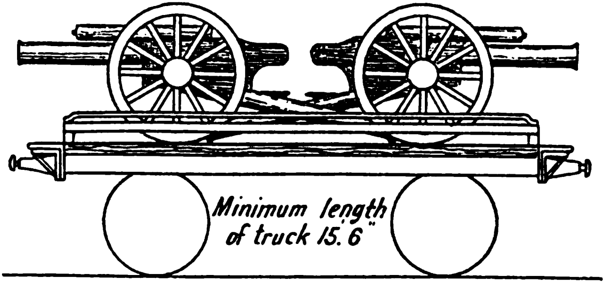
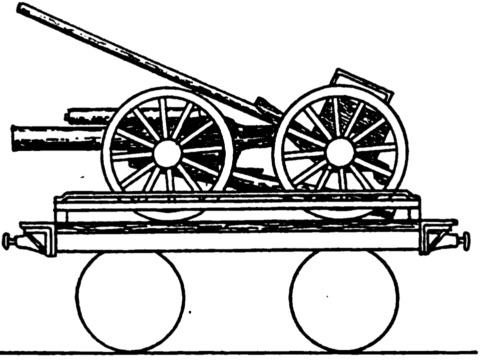

Minimum length of truck 15' 6"

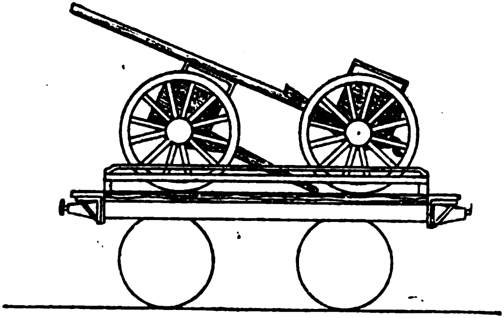
FIG. 2.



Minimum length of truck 12'

PLATE 28.

FIG. 1.



Minimum length of truck 12′

FIG. 2.

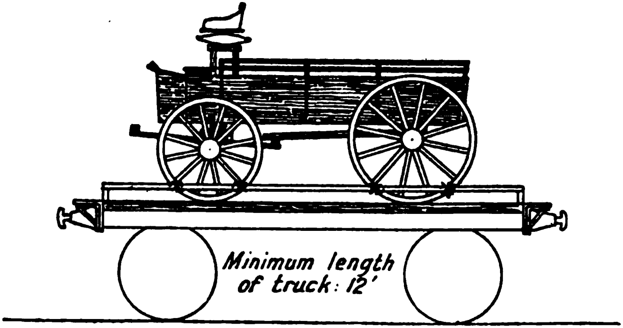

Minimum length
of truck: 12′

PLATE 29.

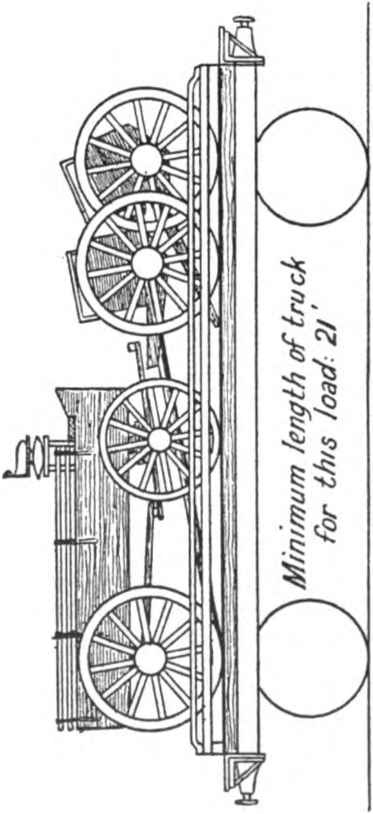

Minimum length of truck
for this load: 21'

PLATE 30.

FRENCH METHOD OF ENTRAINING WAGONS.

FIG. 1.

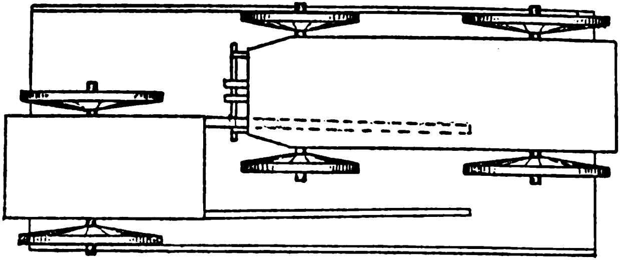
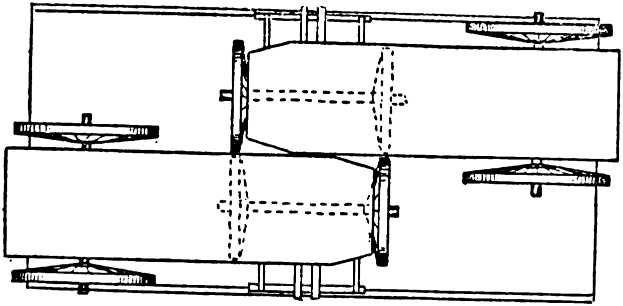


FIG. 2.



After loading the horses and carriages the men will be told off to their compartments. In ordinary rolling stock 8 is the usual number in each compartment.

Time taken entraining Artillery.

Half a battery of artillery should take from 45 to 60 minutes to entrain.

French method of entraining wagons.

A French method of entraining wagons and carts is shown in Plate 30, p. 466. The method shown in Fig. 1, could be adopted on our railways for loading a G.S. wagon and, say, a forage cart provided end-on loading was available, and the truck was not less than 21 feet long.

The method shown in Fig. 2, could be adopted with Mark IV. or any other full lock wagons on trucks which have sufficient breadth, as in France. Trucks in use in the United Kingdom are not sufficiently wide for this purpose.

Entraining Remounts.

To entrain remounts, a gang of 10 or 12 specially selected men should be employed, since it takes men some time to become expert in this work, and they are then invaluable.

The Journey by Train.

Halts required for Men and Horses.

During a long journey it will be necessary to arrange for halts; probably a short halt of 15 minutes every 2 or 3 hours, according to the total length of the journey, and a long one of at least an hour every 8 or 9 hours, or in peace time about every 6 hours, will be necessary for the men and horses to feed and water.

On a very long journey the horses should be detrained once in every 24 hours; walked about for a short time and allowed to roll on sand and gravel. In the journey to Manchuria trains with horses stopped for one day in about every five.

Arrangements at Halting Places.

On arriving at a halting place, the officers will go to the carriages of which they are in charge, and sentries will, if necessary, be posted. The "Dismiss" will then be sounded, and those who wish to get out of the train may do so.

Watering and Feeding.

When it is intended to water and feed horses during a halt, "Water" followed by "Feed" will be sounded, on which the men will proceed to water their horses from buckets. After being watered the horses will be fed from nosebags. No hay or straw is to be left among the horses, and any forage conveyed on the train should be in closed or tarpaulin-covered wagons.

When it is time to proceed, the "Fall in" will be sounded, on which the men will return to their carriages, and the officers will see that they are all present.

Procedure in case of Accident.

In case of accident to the train the officers will proceed at once to the carriages of which they are in charge, and the men will retain their seats until ordered to descend. Directions given by railway officials must be promptly executed.

Detrainment.

Importance of unloading Trains at once.

Trains must be invariably unloaded at once on reaching their destination, and on no account left to stand full, as otherwise rolling stock which may be most urgently needed will be wasted and the station blocked by an accumulation of carriages. This does not, however, apply to supply trains which may be specially detailed to remain loaded at suitable points, ready for despatch to points on the line where their contents are required for issue to columns and parks.

Infantry.

The detrainment is very similar to the entrainment; the men, after getting out of the train and being formed up on the platform, should be marched clear of the station and halted on the nearest convenient open space, where a supply of drinking water and latrine accommodation should be provided. A fatigue party to assist in unloading the regimental transport, etc., should be told off at once.

As soon as the baggage arrives at the open space where the men are halted, they should be marched off with it to their destination.

An infantry battalion should detrain and get clear of the station in 30 minutes.

Cavalry, R.A., etc.

As soon as the men have got out and have been formed up on the platform, they will be marched to some convenient spot to deposit their arms, accoutrements, etc. Each section of men will then fall in opposite its respective horse-truck, with bridles, if these have been removed. A small party will be told off to unload the saddles or harness. The door of each truck should be let down and a mat or loose straw, if procurable, spread upon it; the horse opposite the entrance is bridled and led or backed out by its owner; the horses to the right and left following in turn. The horses should then be formed up and the men in turn will go forward, get their saddles or harness and put it on the horses.

In the case of artillery, a proportion of the drivers will assist the gunners in unloading the guns and carriages after the horses have been detrained. The horses will be hooked in as soon as possible and the battery march to its destination.

A squadron of cavalry or half-battery R.A. should detrain and get clear of the station in 40 minutes.

Platforms and Ramps.

Length of Platform.

A "mixed" train of 35 vehicles, say, 10 passenger carriages and 25 trucks, will occupy a length of about 300 yards.

Allotment of Platforms to Different Arms.

Generally speaking, at large stations the platforms used for passenger traffic would be assigned to the infantry, and those for goods traffic to the other arms.

Construction of Temporary Platforms.

If it is necessary to supplement the existing platform accommodation, temporary platforms can be constructed in various ways.

The most convenient form of platform is one at least 12 feet wide at a level of, say, 2 feet 6 inches to 3 feet above the rails, and with an inclined plane along its whole length from this level down to the level of an adjoining road; but seeing that this would take a large amount of time and material to construct, the next best substitutes are:—

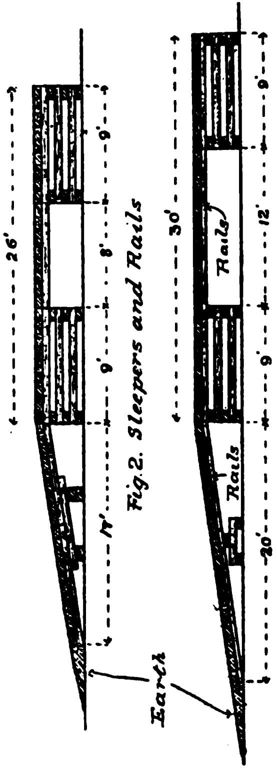
1. A narrow platform, say, 6 feet wide, and an inclined plane along its whole length down to the level of an adjoining road;
2. A platform, say, 12 feet wide, with an inclined plane at each end down to the level of an adjoining road;
3. A platform with a minimum breadth of, say, 8 feet throughout, but broader at intervals, corresponding with the doors of each carriage or truck, and an inclined plane at each end.

Of these three the third has obvious disadvantages. If there is an adjoining road or suitable ground, the first is preferable. If not, the second.

The platform itself can be made either:—

1. By banking up earth or rubble to the required height and facing it on the side towards the rails with four sleepers fastened together and kept in position by uprights.
2. With railway sleepers in either of the forms shown in Plate 31, Figs. 1 and 2, p. 471.

PLATE 31.


26'
9'
8'
9'
17'
30'
9'
12'
9'
20'
Rails
Rails
Earth

Temporary Platforms.

Fig 1 Sleepers only.

Fig.2. Sleepers and Rails

TABLE OF RAILWAY STOCK REQUIRED FOR TRANSPORT OF VARIOUS BODIES OF TROOPS AND TIME REQUIRED FOR ENTRAINING.

The establishment figures in the following table are in accordance with "War Establishments, 1909–10." The details left at the base are *not* included in these figures.

In view of the different kinds of passenger coaches, the accommodation has been calculated in compartments, six officers to each first-class compartment and eight men to each third-class compartment. The figures in parentheses in the 3rd column show the number of compartments required on long journeys if 6 men are carried in each. In cases, however, where the unit takes two or more trains, some officers will travel in each train, and accordingly a compartment has been reserved for each six or less officers in each train.

Seven saddled or harnessed horses are calculated for each cattle truck, but the figures in parentheses in the 4th column show the required number of trucks if eight unsaddled or unharnessed horses are carried in each. Officers' horses in peace time will usually be carried in horse-boxes and accordingly provision must be made for a proportionate increase of rolling stock to that stated.

The Board of Trade Regulations prescribe that a "mixed train," *i.e.* a train composed of passenger coaches, and horse-boxes or cattle-trucks, must not exceed 25 vehicles, including the three brake-vans which are essential. The approximate number of trains required for each unit, which is shown by those figures in the 1st column which are *not* in parentheses, has been calculated on this basis.

In cases of emergency the Board of Trade regulations would not be rigidly enforced, and mixed trains of more than 25 vehicles would advantageously be employed. The actual length would be governed by ruling gradients, length of platforms and sidings and other local conditions, but in general practice in the United Kingdom it is safe to assume that trains of about 35 vehicles can be conveniently handled, provided that the bulk of the vehicles are four-wheeled.

The figures given in parentheses in the 1st and 6th columns show the amount of rolling stock required if the trains are made up of about 35 vehicles.

The figures *not* in parentheses in the 5th column give the number required if 15′ 6″ trucks are used for guns, ammunition wagons with limbers, limbered wagons, and all other wagons and carts, while those in parentheses give the number required if 21-feet trucks are used. The basis on which the passenger rolling stock has been calculated in the following pages is 6-wheel coaches capable of holding 40 men.

For British India standard gauge 5′ 6″ train, see pp. 477–484.

On the Metre Gauge systems of British India, Burmah, and the Straits Settlements, for mixed trains of equal length with those assumed as a basis for computation in the United Kingdom, the carrying capacity would be about 80 per cent. for vehicles carrying troops, and about 75 per cent. for vehicles carrying ammunition, baggage and equipment, while for guns, wagons and carts, the carrying capacity will be little less than in the United Kingdom. In South Africa the gauge is 3′ 6″, and the carrying capacity of all vehicles may be reckoned at fully 90 per cent. of those in use in the United Kingdom. In many parts, however, gradients are severe, and train lengths would consequently be restricted.

In Canada and U.S.A. the gauge is the same as that in the United Kingdom, viz. 4′ 8½″. All rolling stock is of the bogie pattern, and the carrying capacity of trains, length for length, may be taken as fully 5 per cent. more than in Great Britain.

Australasia has three gauges, viz. New South Wales, 4′ 8½″; Queensland, Western Australia, Tasmania, and New Zealand, 3′ 6″; Victoria, 5′ 3″; and South Australia both 5′ 3″ and 3′ 6″. The Transcontinental railway now under construction is 4′ 8½″.

The carrying capacity of vehicles on the 5′ 3″ and 4′ 8½″ gauges is much the same as on the 4′ 8½″ gauge in Great Britain, while on the 3′ 6″ gauge the capacity may be taken as nearly up to the standard of the South African railways, but as in the case of South Africa, severe gradients in many parts would restrict train lengths.

In Egypt and the Sudan both the 4′ 8½″ and the 3′ 6″ gauges are in use, and the carrying capacity of trains and vehicles is much the same as in England and on the Metre Gauge systems of India respectively.

In China the gauge is 4′ 8½″ and the carrying capacity of trains and vehicles may be assumed as rather greater, say 5 per cent., than in the United Kingdom.

Irish Gauge is 5′ 3″. Russian 5′ 0″. W. Europe generally 4′ 8½.

NOTE.—For explanation of figures in parentheses, see p. 472.

Number of officers, men, horses, guns, wagons, etc., in each unit.	1 Approximate No. of trains required.	2 Passenger compartments. First class.	3 Passenger compartments. Third class.	4 Cattle trucks or covered wagons for horses.	5 Carriage trucks for wagons or guns.	6 Brake vans carrying baggage also.	7 Approximate time required for entraining each unit.
Cavalry Regt.	5¼ (3⅔)	..	..	..	..	16 (11)	45–60 mins. each train.
26 officers .	..	5	..	..	..	..	
523 N.C.O.'s and men .	..	..	66 (88)	..	..	..	
608 horses .	..	..	..	85 (74)	..	..	
17 wagons (10 limbd. 7 G.S.) . .	..	..	..	..	15 (12)	..	
2 carts . .	..	..	..	..		..	
Cav. Squadron	1½ (1)	..	..	..	..	4 (3)	45–60 mins.
6 officers . .	..	1	..	..	..	..	
153 N.C.O.'s and men .	..	..	20 (27)	..	..	..	
167 horses .	..	..	..	25 (22)	..	..	
4 wagons (2 limbd.) . .	..	..	..	..	4 (3)	..	
Infantry Batt.	2¼ (1¾)	..	..	..	..	7 (4)	40 mins. each train.
30 officers . .	..	6	..	..	..	..	
997 N.C.O.'s and men .	..	..	125 (166)	..	..	..	
64 horses and mules . .	..	..	..	10 (9)	..	..	
4 G.S. wagons	..	..	..	..	11 (7)	..	
3 limbered wagons (including 2 M. guns) . .	..	..	..	..		..	
9 carts . .	..	..	..	..		..	

NOTE.—For explanation of figures in parentheses, see p. 472.

Number of officers, men, horses, guns, wagons, etc., in each unit.	1 Approximate No. of trains required.	2 Passenger compartments.	3	4 Cattle trucks or covered wagons for horses.	5 Carriage trucks for wagons or guns.	6 Brake vans carrying baggage also.	7 Approximate time required for entraining each unit.
		First class.	Third class.				
Infantry Company .	½ (⅓)	. .	. .	. .	. .	2	15–20 mins.
6 officers	. .	2	. .	. .	. .	. .	
221 N.C.O.'s and men	. .	. .	30 (40)	. .	. .	. .	
Say 16 horses . . .	. .	. .	. .	2 (2)	. .	. .	
Say 1 cart	. .	. .	. .	. .	1 } (1)	. .	
Say 2 wagons . . .	. .	. .	. .	. .	2	. .	
Field Artillery Battery	2 (1½)	. .	. .	. .	. .	6(5)	45–60 mins. each train.
5 officers	3 R.F.A. Batteries and Headqrs. could be conveyed in 6 (4½) trains.	2	. .	. .	. .	. .	
195 N.C.O.'s and men		. .	25 (33)	. .	. .	. .	
172 horses		. .	. .	26 (23)	. .	. .	
6 guns with limbers 12 ammunition wagons with limbers		. .	. .	. .	12 (9)	. .	
2 G.S. wagons . .		. .	. .	. .	2 } (2)	. .	
1 cart		. .	. .	. .	1	. .	
Field Company . .	1½ (1)	. .	. .	. .	. .	4 (3)	
6 officers	. .	1	. .	. .	. .	. .	
211 N.C.O.'s and men	. .	. .	27 (33)	. .	. .	. .	
76 horses and mules	. .	. .	. .	11 (10)	. .	. .	
2 pontoon wagons 4 double carts . 5 carts . . . . 2 wagons (1 trestle)	. .	. .	. .	. .	11 (8)	. .	

APPROXIMATE NUMBER OF TRAINS REQUIRED FOR TRANSPORT OF DIFFERENT UNITS AT WAR STRENGTH.

Unit.	Approximate number of trains required.	
	If train of 25 vehicles used.	If train of 35 vehicles used.
Cavalry Division.		
Headqrs. of a Cavalry Division	¾	½
Headqrs. of Cav. Brig.	⅓	¼
Cavalry Regiment	5¼	3⅔
Cavalry Squadron	1½	1
Headquarters of Cav. Divisional Artillery	¼	⅙
Headquarters of Horse Artillery Brigade	⅓	¼
Horse Art. Battery	2½	1¾
Horse Artillery Brig. Ammunition Col. (Hdqrs. and 2 sects.)	4	2½
Hdqrs. of Divl. R.E.	⅙	⅛
Field Troop	1	¾
Wireless Tel. Coy.	1½	1⅛
Cav. Div. T. and S. Col. (Hdqrs. and 5 Coys. A.S.C.) Headqrs.	⅙	⅛
Headqrs. Coy. and 4 Companies	7	5
Cav. Fld. Am. (2 sects.)	1¾	1¼
Summary.		
Whole Cavalry Div.	102	72
Cavalry Brigade	16	11¼
Infantry Division.		
Headqrs. of a Div.	1	¾
Infantry Div.—cont.		
Hdqrs. of an Inf. Brig.	½	⅓
Infantry Battalion	2¼	1½
Infantry Company	½	⅓
Hdqrs. of Divl. Arty.	¼	⅙
Hdqrs. of F.A. Brig.	⅓	¼
Field Artillery Baty.	2	1½
F.A. Brig. Am. Col.	5⅓	3¾
R.F.A. (Howitzer) Brig. Headqrs.	⅓	¼
R.F.A. (Howitzer) Battery	2	1⅓
R.F.A. (Howitzer) Brig. Am. Column	2⅙	1½
Heavy Artillery Bty.	2¾	1¾
H.A. Baty. Am. Col.		
Divisional Amm. Column (Hdqrs. and 4 Sects.)	15⅓	10¼
Divl. Engin. Hdqrs.	⅙	⅛
Field Company	1⅓	1
Divl. Telegraph Coy.	¾	½
Divl. T. and S. Col. (Headqrs. and 4 Coys. A.S.C.)	6	4
Divl. T. and S. Park Headqrs. and No. 3 Section (Horse)	6½	4½

Unit.	Approximate number of trains required.	
	If train of 25 vehicles used.	If train of 35 vehicles used.
Infantry Div.—cont.		
Nos. 1 and 2 Sections (Mechanical) . . .	—	—
Bakery Detachment .	1⅓	1
Field Amb. (3 Sects.) .	1¾	1¼
Summary.		
Whole Infantry Div. .	113	82
Infantry Brigade . .	9½	7½
Cavalry Brigade.		
Headquarters . . .		¼
Horse Artillery Baty. with a Cav. Brig. . Am. Column of Horse Arty. with a Cav. Brig. (Headqrs. and 1 Section) . . .	4½	3

Unit.	Approximate number of trains required.	
	If train of 25 vehicles used.	If train of 35 vehicles used.
Cavalry Brig.—cont.		
Cavalry Brig. (Transport and Sup. Col.	1¾	1⅛
1 Compy. A.S.C.) .	1¾	1⅛
Cavalry Brig. Field Ambulance . . .	1⅓	1
Summary.		
Cavalry Brigade* .	22¾	15¾
Army Troops.		
Cable Telegraph Co.	2	1⅓
Air-line Tele. Coy. .	2½	1¾
Balloon Company .	1	¾
Bridging Train† . .	4½	3
An Army Troop's T. and S. Column .	1¾	1¼

CARRIAGE TRUCKS IN COMMON USE.

In the U.K. the following are the carriage trucks in most common use :—

L.N.W. Ry.	16′ 0″	21′ 0″	
G.W. Ry.	16′ 0″		21′ 0″
North Eastern Ry.	14′ 7″	16′ 0″	24′ 7½″
Midland Ry.	14′ 6″	20′ 0″	24′ 0″
L.S.W. Ry.‡	14′ 6″	16′ 0″	26′ 0″
Great Central Ry.	16′ 7″	21′ 0″	
Great Eastern Ry.‡	13′ 1″	16′ 0″	24′ 0″
Great Northern Ry.	16′ 6″	18′ 0″	
L.B. & S.C. Ry.	18′ 0″	22′ 0″	26′ 0″
S.E. & Chatham Ry.	16′ 0″	18′ 0″	23′ 0″

Lancs. & Yorks. Ry.	16′ 0″	20′ 11″	45′ 0″
Caledonian Ry.	15′ 0″	16′ 0″	24′ 0″ 27′ 0″
North British Ry.	18′ 0″	21′ 0″	32′ 0″ 45′ 0″
G.N. of Ireland Ry.	15′ 0″		
G.S. & W. Ry. (Ir.)	15′ 0″		
Dublin & S.E. Ry.	16′ 8″		
M. & G.W. of Ir. Ry.	15′ 8″		

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* Calculated on basis of 1 Cav. Reg. and 2 M.I. Bns. If 2 Cav. Regs. and 1 M.I. Bn. increase by ½ and ¼ respectively.

† Use 18′ trucks for pontoons.

‡ Both these Railway Companies also use 18′ 0″ carriage trucks.

Goods and other Trucks Suitable for Military Use.

Machinery and timber trucks are almost as useful for transport purposes as carriage trucks, except that the latter are shorter and only capable of carrying two pairs of wheels. Special arrangements must also be made for removing the bolsters and lashing the wheels to the trucks, since no provision is made on machinery and timber trucks for securing wheels. Several thousands of carriages, machinery and timber trucks are available, but on occasions when a very large movement is taking place and the supply is not sufficient, the next most suitable are drop-sided ballast wagons, which average from 14 to 16 feet, and of which some thousands are available in the U.K. The next most suitable are low-sided goods wagons, with sides of one foot and under, of which many thousands are also available. Beyond these, there are considerably over one hundred thousand open goods wagons, with sides not exceeding 2′ 6″, of an average length of 15′ to 16′, but practically the whole of these have only a narrow door or flap in the sides, which is not wide enough to admit wheels; vehicles would therefore have to be lifted in, thus entailing a considerable loss of time. The carrying capacity of drop-sided and low-sided wagons, owing to their rigid ends, is somewhat less than "open" carriage trucks of the same length.

The tendency of the principal railway companies is to increase the length of the smaller sized carriage trucks to an average of from 20 to 21 feet.

The "clearance" height varies on the different railway companies' systems, but, generally speaking, the wagons and other vehicles should be loaded so as to bring the highest part of the load not more than 9 feet from ground level.

The inside measurement of trucks may be taken as not being more than 7 feet in width.

CANADA.

The railways in Canada have a large number of "flat" cars which are practically equivalent to the carriage trucks in use in the United Kingdom. They vary in length from 33′ 2″ to 41′. Stock cars range from 31′ 6″ to 34′ and are capable of holding 16 horses each, either saddled or harnessed.

There are also a certain number of "Palace" stock cars, constructed for working with passenger trains, which take 16 horses in separate stalls.

Box cars, suitable for the conveyance of stores and baggage, range from 27′ 10″ to 36′.

INDIA.

Gauges.

There are three gauges in common use in India:—

5′ 6″ or broad (standard) gauge.
3′ 3⅜″ or metre gauge.
2′ 6″ or narrow gauge.

Unless otherwise specified, the standard gauge is that referred to in all the following calculations.

Train Loads and Comparative Conveying Capacity.

The ordinary troop train on the standard gauge is as a rule formed of about forty-five vehicles, that being the average load for a passenger engine.

On the metre gauge an average train load is forty vehicles; and twenty vehicles on the narrow gauge.

The carrying capacity of three metre gauge trains, or five narrow gauge trains, is approximately equal to that of two standard trains.

The tables are based on 4-wheel vehicles, but new passenger stock is now mostly bogie stock. Bogie stock may be used in lieu of 4-wheel, but total length of train must not exceed 1,300 feet, nor total gross load 800 tons. The carrying capacity of all Indian rolling stock is marked on each vehicle.

Speed of Troop Trains.

The speed of troop trains on the standard gauge is, including short stops, not more than 15 miles an hour, and on the metre (or narrow) gauge about 13.

Engine runs.

Engines can run for 18 hours out of 24, and can do about 30 miles without re-watering. An engine usually makes a run of about 100 miles, and is then relieved by another, since each engine driver only takes his engine over that length of road which he knows well and is accustomed to drive.

Number of Trains in a Given Time.

On a double line of railway, when military traffic takes precedence, about 20 troop trains can be despatched from a suitable station in 24 hours. On a single line of railway, such as most Indian railways are, the governing factor is the longest distance between two places where, as a rule, trains can cross each other. The shortest interval of time between trains is double the time it takes a train to traverse the distance between stations.

Platform Accommodation required.

The platform, or siding, for a troop train should be 750 feet long, and 15 to 30 feet broad. Platforms for the 5′ 6″ gauge stock should be 3′ 6″ above rail level, and 2′ 6″ from the centre of the nearest rail. If only a short length of platform is available, this must be used for horses and wagons.

Engines.

The standard passenger engine for 5′ 6″ gauge, and full of water and fuel, weighs with tender about 106 tons. Its tender carries 8 tons of fuel and requires 3,000 gallons of water. Total length with tender, about 60 feet. The standard goods engine is similar to the above in all respects, but 10 tons lighter.

The standard passenger engine for metre gauge weighs with its tender 60 tons, and carries 4 tons of fuel and 2,000 gallons of water; total length, with tender, about 55 feet.

The metre gauge goods engine is similar to the passenger engine, except that it is 58 feet long.

An engine can draw on the level about three times its own weight.

Rolling Stock.

A standard gauge passenger carriage (4 wheel) occupies about 28 feet of rail, a passenger bogie carriage 56 to 64 feet, and a 4-wheel goods wagon 24 feet. A metre gauge 4-wheel passenger carriage occupies 27 feet of rail, a passenger bogie 45 feet, and a goods wagon 24 feet. A standard gauge 4-wheel goods wagon can carry from 10 to 23 tons.

Time required for Entraining.

Forty-five to sixty minutes are required to fill and despatch a troop train conveying cavalry, artillery, or mounted infantry, and 40 to 65 minutes to detrain them.

Forty-five minutes are required to entrain a battalion of infantry, and 30 to 45 minutes to detrain them.

During a long journey 4 hours in every 24 should be allowed for halts, exclusive of the railway stops.

If successive trains run at 2 hour intervals all trains receive ample time for loading and unloading, except camel trains which require 3 hours.

Capacity of Rolling Stock.

The following Table "A" gives the capacity of standard 4-wheel rolling stock on the 5′ 6″ gauge, but modern carriages now being built are nearly all bogies, which vary greatly in capacity. Rolling stock on the metre and narrow gauges, including the goods wagons, is also mostly of the bogie type.

Troops and followers should not be mixed in the same bogie carriage.

TABLE A.

CAPACITY OF STANDARD ROLLING STOCK ON 5′ 6″ GAUGE.

Description.	No. of compartments.	Capacity.
1st class carriage (4 wheel)	2	8 British officers.
2nd class carriage (4 wheel)	2	18 Native officers, or warrant officers or staff-sergts., or clerks or S. and T. agents.
Composite carriage, 1st and 2nd class	2	4 British officers; and 9 Native officers or warrant officers, etc.
3rd class carriage (4 wheel)	6	6 British or Native soldiers, or 10 followers per compartment.
3rd class bogie carriage .	..	75 soldiers, or 128 followers.
Horse-box, double . . .	..	6 chargers and 3 attendants.
Horse-box, single . . .	..	3 chargers and 3 attendants.
Covered horse or cattle wagon	..	8 horses or ordnance mules; 10 ponies or transport mules; 8 siege train bullocks; 8 Army transport bullocks; 10 Army transport small pack bullocks; 12 donkeys; also 2 followers and line gear.
Open truck, or wagon . .	..	4 camels and 1 follower.
Covered goods wagon, 10 to 18 tons	..	Baggage and stores up to its full marked capacity, with a minimum of 5 tons of bulky articles.
Open trucks (not less than 18′ long)	..	3 pairs of wheels, artillery carriages; 3 tongas (hospital); 18 A.T. carts (wheels and poles taken off).
Powder van	..	5 tons.
Brake van	..	Saddles and harness; or 2½ tons of baggage and tentage.

TABLE B.

TOTAL NUMBER OF TRAINS REQUIRED FOR UNITS AT WAR STRENGTH ON 5′ 6″ GAUGE (4-WHEEL VEHICLES). WITHOUT TRANSPORT BUT WITH HORSES AND EQUIPMENT MULES.

Unit.	Total trains.	Trains.		Remarks.
		Number.	Vehicles.	
British Cavalry Regiment . . .	2	1	45	
		1	45	
Indian Cavalry Regiment . . .	3	2	40	
		1	32	
British Infantry Battalion . . .	1	1	38	
Indian ,, ,, . . .	1	1	36	
Indian Pioneer Battalion . . .	1	1	38	
R.A. Units.				
R.H.A. Battery	1	1	45	
R.F.A. Battery, 18-pr. Q.F. . .	1	1	43	
R.F.A. Howitzer Battery . . .	1	1	42	
Mountain Battery, British or Ind.	1	1	42	
Heavy Battery, 30-pr., or 4″ B.L.	1	1	45	With its Amm. Col.
Heavy Battery, 5″ B.L.	2	1	44	With its ,, ,,
		1	10	
R.H.A. Section, Cavalry Brigade Ammunition Column	1	1	27	
R.F.A. Section Divl. Amm. Col. .	2	2	45	
Howitzer Brigade Ammunition Col.	2	1	45	
		1	18	
Engineer Units.				
Field Company, Sappers and Miners	1	1	15	
Railway Company, ditto . . .	1	1	16	
Pontoon Section, ditto	1	1	44	
Engineer Field Park	½	1	10	
,, Siege Park	½	1	11	
Oversea Telegraph Section . . .	½	1	12	

Unit.	Total trains.	Trains.		Remarks.
		Number.	Vehicles.	
Engineer Units—continued.				
Printing Section, S. & M.	..	..	2	
Photo-Litho Section, S. & M.	..	..	2	
Medical, etc., Units.				
British or Indian Field Ambulance				Equipment only.
Whole unit	..	½	9	
Three sections	..	..	8	
Two ,,	..	..	6	
One section	..	..	5	4 only for Ind. Sect.
British General Hospital, 500 beds	1	1	35	
Indian ,, ,, ,, ,,	1	1	23	
Field Veterinary Hospital	..	..	5	
Half ,, ,,	..	..	3	
Veterinary Store Depôt	..	..	4	
Transport Units.				
Cavalry Brigade Mule Corps	3	2	43	With 300 A.T. carts.
		1	41	
Pack Mule Corps	2	2	45	Without carts.
Pony Cart Train	3	3	44	
One Half Troop of A.T. or S.T. Bullocks	..	..	7	Without carts.
Four ditto	1	1	27	,, ,,
Bullock train, hired	3	1	44	,, ,,
		2	45	,, ,,
Camel Corps	4	4	45	
Larger Units.				
A Cavalry Brigade	11	..	..	
An Infantry Brigade	4	..	..	Fighting Troops only.
" Divisional Troop " of 1 Div.	14	..	..	
A Division	26	..	..	

TABLE C.

COMPOSITION OF TROOP TRAINS, 5′ 6″ GAUGE. UNITS AT WAR STRENGTH (WITHOUT TRANSPORT). 4-WHEEL VEHICLES.

Unit.	Train.		Carriages.				Wagons.			Horse boxes.	Brake vans.
	No.	Vehicles.	1st class.	2nd class.	Composite.	3rd class.	Covered goods.	Open.	Horse or cattle.		
British Cavalry Regiment	1	45	2	1	..	5	2	..	29	4	2
	1	45	1	..	1	6	2	..	29	4	2
Indian (Silladar) Cavalry Regiment	2	40	..	..	1	5	2	..	29	1	2
	1	32	..	..	1	4	2	..	21	2	2
Battalion British Infantry	1	38	3	..	1	26	2	..	2	2	2
Battalion Indian Infantry	1	36	1	1	2	22	3	..	2	3	2
Battalion Indian Pioneers	1	38	1	1	2	22	3	..	4	3	2
R.A. Units.											
R.H.A. Battery	1	45	..	..	1	4	2	11	23	2	2
R.F.A. Battery 18-pr. B.L.	1	43	..	..	1	4	2	11	21	2	2
R.F.A. Battery, Howitzer	1	42	..	..	2	5	2	10	19	2	2
Mountain Battery, British or Indian	1	42	..	..	2	8	5	..	24	1	2
Heavy Battery, 30-pr., or 4″ B.L., with Amm. Column	1	45	..	..	2	5	3	9	22	2	2
Heavy Battery, 5″ B.L., with Amm. Column	1	44	..	..	1	4	1	9	26	1	2
	1	10	..	..	1	2	1	2	1	1	2
R.H.A. Section Cavalry Brigade Amm. Column	1	27	..	..	1	2	..	9	12	1	2
R.F.A. Section Divl. Amm. Column	1	45	..	..	1	2	2	17	20	1	2
	1	45	..	..	1	2	1	17	21	1	2
Howitzer Brigade Ammun. Column	1	45	..	..	1	2	1	16	21	2	2
	1	18	..	..	1	2	1	6	6	..	2

Unit.	Train.		Carriages.				Wagons.			Horse boxes.	Brake vans.
	No.	Vehicles.	1st class.	2nd class.	Composite.	3rd class.	Covered goods.	Open.	Horse or cattle.		
Engineer Units.											
Field Compy. Sappers and Miners	1	15	..	..	1	6	2	..	2	2	2
Railway Compy., ditto	1	16	..	1	1	6	5	..	..	1	2
Pontoon Section, ditto	1	44	..	..	1	2	..	38	..	1	2
Engineer Field Park	½	10	..	..	1	1	7	..	..	1	..
Oversea Telegraph Section	½	12	..	2	1	2	5	..	..	1	1
Printing or Photo-Litho Section, S. and M.	..	2	..	½	..	⅙	..	..	..	..	1

TRANSPORT BY SEA.

Classification of Ships for Troops, Stores, etc.

Ships are classified as under :—

(1) Transport, *i.e.* ships wholly engaged for the Government service on time charter ; and

(2) Freight Ships, *i.e.* ships in which conveyance is engaged for certain bodies of troops or stores, but which are not wholly at the disposal of the Government

Transports are utilised for the conveyance of large bodies of troops with their supplies and stores, and also as Hospital Ships.

Freight ships are called either :—

(*a*) Troop Freight Ships, if they carry troops ;

(*b*) Remount, mule, or cattle freight ships, if they carry horses, mules, or cattle ;

(*c*) Store freight ships, if they carry stores.

Ships carrying supplies only are sometimes called "All Supply Ships."

Embarkation of Men.

Preparation of Transports.

When the transport, complete with all the necessary fitting for men and horses, has been inspected and taken over—which will usually be a considerable time before the arrival of the troop trains—the number of each squadron, battery or company should be marked with chalk on each of the tables on the troop deck. In addition to this the number of men who are to be told off to each mess should be marked. This number should be communicated to the officer commanding each troop train immediately on his arrival.

Arrival of Troop Trains.

In England the troop trains will as a rule be run direct on to the wharf alongside which the transport is lying, and the troops after detraining will be formed up in line on the wharf facing the transport, the men being in marching order and carrying their sea kit-bags, etc. They should then be told off into messes. Since the sergeants will have their own mess, a corporal should be placed in charge of each of the men's messes.

Marching Men on Board.

As each squadron, battery or company marches on board the men should hand over their rifles, which are then placed in the arm-racks, each rifle before embarkation having had a label pasted on the butt showing the owner's name and regimental number and another with the letter or number of the company on the heel of the butt. Pouch ammunition, if carried, should be given up at the same time.

The men will then proceed to their respective messes, take off their accoutrements and hang them up on the battens over the mess places, stowing away their sea kit-bags in the racks over the mess tables. Kit-bags and waterproof bags will be stowed in a separate baggage-room. The men will sit down at the mess tables and await orders. Fatigue parties for loading baggage, stripping horses, etc., can then be detailed.

Naval Terms.

All officers and men should be acquainted with the following Naval Terms and Orders :—

A ship is divided lengthwise into the *Fore Part*, or Bows ; *Midships*, or Waist ; *After Part*, or Stern.

Starboard is the right, Port the left side of the ship, looking forward.

Forward = Towards the bows.
Aft or Abaft = Towards the stern.
Fore and Aft = Lengthways of the vessel.
Thwartships = Across.
Alongside = By the side.
Foc'sle = In the fore part of the ship.

Quarter Deck = A portion of the deck reserved for officers.

Accommodation Ladder = A ladder-way or staircase for entering a boat lying alongside a ship, and *vice versa*.

Gangway = A plank used to pass from a ship or a boat to shore; also, in a ship, the entrance to which the accommodation-ladder leads.

Gang-plank = A special form of gangway for embarking or disembarking on or from a boat on an open beach.

Sea Gangway = Narrow steps secured to the ship's side, with a rope hung against them for men to hold on to.

Gunwale = A term used in a general way for the top of the sides of a boat.

Freeboard = The distance between the water and the gunwale.

Lanyard = A short piece of cord for tying on a knife, oar, etc.

Thwarts = Seats for rowers in a boat.

Stretchers = Rests for feet of rowers.

Stern-sheets = The space between the after thwart and the stern, fitted with seats for passengers and steersman.

Rowlocks = Places cut in the sides of a boat for the oars to fix into when rowing.

Poppets = Pieces of wood which fit into the rowlocks when the boat is under sail.

Crutch = A metal swivel rest for the oar to fit into when rowing; they are usually removable, but secured to the boat by a lanyard.

Halyards, Stays, Guys are names for ropes. Halyards are used for hoisting purposes; Stays to support masts, etc.; Guys for working derricks or other moving spars.

Cleats = Pieces of wood or metal round which halyards, etc., are secured.

Painter = A rope fastened to the bows of a boat with which to tow or fasten it.

Naval Orders.

Ship or Unship = Fix or unfix ; put into place or take out of place.

Back Starboard = Reverse the oars on the starboard side and backwater.

Back Port = Reverse the oars on the port side and backwater.

Ease off = Slacken off.

Stand by = Be ready.

Toss your oars = Lift oars to a perpendicular position and retain them there.

Boat your oars, or ship oars = Place all oars inside the boat, blades forward.

When leaving the Ship or Pier.

Oars down = Place oars in the water.

Give way together = Commence rowing.

When approaching the Ship or Pier.

Bows = Bow oar "boats" his oar and gets ready to act as ordered.

Way enough = After the bow oars are laid in, this is the order given to the rowers at which they stop rowing and toss and boat their oars ; or in a gig or boat fitted with "crutches" (from which oars cannot conveniently be "tossed") stop rowing and allow their oars to swing free, fore and aft.

Embarkation of Horses.

Preparing Horses for Embarkation.

Horses for some days prior to embarkation should be given a considerable amount of slow and steady work and their allowance of oats should be reduced, so that at the time of embarkation they may be somewhat low in flesh and not in too high condition.

Before embarkation all horses should be carefully inspected by a veterinary officer to see that they are healthy and free from infectious or contagious disease.

Horses should be kept without food or water for 2 hours before being embarked, for the reason that slinging may injure them when their bellies are distended, and also because they become more quickly reconciled to their new quarters on board if they are fed as soon as they are placed in their stables.

Troop horses should be shod shortly before embarkation, otherwise they may arrive footsore, and so on arrival be incapable of work or even of being shod.

Arrangements for Embarking.

The horses which are to be embarked should be drawn up by troops on the wharf close to the transport, saddlery or harness taken off and packed in sacks with each man's number on it, and the ship's halters put on under the head collars. The dismounted men will meanwhile be told off into messes, and after stowing their arms, kits, etc., on board, as previously explained, and putting on fatigue dress, will relieve the mounted men, who will be similarly told off into messes and stow their kits. The mounted men, after carrying the harness and saddlery on board and handing them over to a party to stow away, will prepare to embark the horses, while the dismounted men get the baggage, etc., on board.

EMBARKING HORSES.

Estimate of number of Horses which can be carried.

To ascertain roughly the number of horses which can be carried on a deck, deduct all portions where there is less than 12 feet clear from the ship's side to the gangway, and the remaining length in yards will give the approximate number of stalls.

1. *From a Wharf.*

When embarking from a wharf the horses should be walked on board up a gang-board in close succession without a check.

Battens should be nailed on this gang-board at intervals of 18 inches, and it is also advisable to have both sides of each of the gang-boards planked to a height of 3 feet.

If the size of the hatches permits, the horses can be walked down another gang-board called "brows," to the lower decks, but if not, they must be lowered as explained below. Hatchways should be at least 10 feet square to be of any use for horses, and the longer they are the better, so as to admit of sufficient headroom for fitting brows.

Slinging Horses.

If the horses cannot be walked on board, they must be slung in the following manner, the head rope having first been fastened in the ordinary way round the neck and the bridoon reins left loose, but knotted, in order to prevent them getting entangled in the horse's legs.

Five men are required to sling a horse quickly and well: one man holds the head guy, which is fastened to the head collar; the second and third men stand one on each side of the horse, one holding the sling and passing the band under the horse's belly to the other man. Both men then hold up the ends over his back, and pass the long loop through the shorter, at the same time hooking it on to the lifting tackle and holding the sling until the horse's feet are clear of the ground; the fourth man stands in front of the horse and fastens the breast strap, while the fifth is behind and secures the breeching.

When all is ready the word "hoist away" is given, and the first man pays out the head guy rope, just keeping it sufficiently taut to keep the horse's head steady.

The horse should be run up from the ground quickly, and after reaching the necessary height be lowered carefully and steadily down the hatchway, the head guy being meanwhile let loose.

Four or five active men should be on the horse deck ready to receive the animal, and if the horse is to be sent to a still lower deck, men must be stationed at the hatchways on each deck to see that he is not injured in passing through the hatch ways.

A soft bed of straw should be provided on to which the horse is lowered. Directly his feet feel the deck the sling should be removed, and the horse made much of, but firmly handled, otherwise he is apt to kick and plunge.

From 20 to 30 horses can be slung in this way per hour by one set of tackle or hoisting engine, the rate depending on the expertness of the men.

The most usual accidents which occur are: (1) The horse falling backwards out of the sling; (2) the horse plunging as soon as it feels its feet and thereby injuring himself or the men receiving him. To prevent these accidents the men should see that the breast strap and breeching are tight, and that the horse on landing is firmly handled.

After being released from the slings each horse should be at once placed in his stall, the stalls at the far end of each range being filled up first, and care being taken to place the horses as much as possible in the order they have been accustomed to occupy in stables.

2. *In Horse-boats.*

If the transport is unable to come alongside a wharf, the horses should be embarked in flat-bottomed boats or lighters which are large enough to allow the horses to stand athwartships, alternately head and tail, the men in charge of the horses sitting on the gunwales holding the head ropes. The horse-boats are usually constructed so that the sterns can be let down and form a gangway when the boats are grounded on a beach; the horses can then be walked on board and the boat towed out to the transport. On arriving alongside, the horses are slung out of the boat and into the transport as mentioned above.

If the boats cannot come near enough to the shore to enable the horses to be either led or hoisted on board, a pier or platform must be built out.

When horses have to be slung into boats, care must be taken that on each horse reaching the boat he is facing either the bow or the stern. If this precaution is neglected, he may get his legs over the side of the boat.

3. *Swimming Horses.*

When suitable boats and appliances are not available, the following method of embarking horses by swimming can be employed:—

(1) The horses, after being halted a short distance from, and out of sight of, the point of embarkation, should be stripped of all saddlery except the bridoon and head-stall, which should be close fitting.

(2) Each horse should be led to the appointed place, where a rowing boat—one with two oars is sufficient—is in readiness to convoy him to the ship. Two experienced men should then prepare him for swimming. No. 1 holds his head while No. 2 places the sling on him and secures the straps with spun-yarn or string to prevent the sling opening in the water; having done this, he fastens securely the breast rope and breeching. A rope about eight yards in length with an eye at one end is next passed round the horse's neck and fastened tightly with an over hand knot, so as to prevent it tightening or slackening. The bridoon is next taken off and another similar rope attached to the lower ring of the head-stall under the horse's chin, in order to keep his mouth above water. He is, however, controlled by the neck rope.

(3) The horse should then be led into the water towards the boat as far as he will walk. A man in the stern of the boat should take the head-stall rope in his left hand, and at the same time the neck rope in his right hand and at once reeve it through the stern ring of the boat, in order to secure additional power if the horse plunges. Not more than four horses, two on each side, should be taken by each boat, unless it is a very large one.

(4) When once the horse is swimming, the neck rope should

be hauled close up, while the head-stall rope greatly supports his chin.

(5) The boat should not be pulled too fast or the horse will make no attempt to swim.

(6) On reaching the transport the hook and tackle should be lowered, the hook passed through the eye of the sling and the horse run quickly up and received on board, care being of course taken to arrange the tackle so that the horse, while being hoisted up, is kept clear of the side.

Embarking Artillery, Transport Wagons and Pontoons.

In embarking artillery, transport wagons and pontoons, care must be taken that each unit is complete in the same ship, and that in no case a gun or wagon is on board one ship whilst the horses for it are on another.

Before embarking artillery, the cartridges, fuzes and tubes will be removed and stowed away in the ship's magazine, while shell and case shot will remain in the limber boxes.

The guns and wagons should be put on board before the horses, the harness being packed in bundles and placed in a dry place on board, tags being fixed to each bundle, specifying the number of the wagon to which the harness belongs. The wheels should be taken off before embarkation, and the linch-pins and washers carefully put away.

When embarking from a wharf the guns, wagons and pontoons should not as a rule be taken to pieces, but should be hoisted on board intact, the wagons being kept loaded, but in no case must the load exceed 8′ 6″ from the ground. The poles of wagons should be lashed to them. Similarly when embarking from boats the guns and wagons should be slung on to the boats intact and from thence into the ship.

A good method of embarking pontoons when the transport is not alongside a wharf is to run the pontoon wagon, with the pontoon on it, into the water until the pontoon floats, carrying the wagon under it. It should then be towed out to the transport, and the wagon and pontoon slung on board.

Routine on Board.

Apart from the special duties of police, orderlies, assistants to ship's cooks and bakers, and hammock stowers, for which provision must be made, men should be detailed immediately after embarkation for the following duties, either for the whole voyage or the day, the former being on the whole preferable since the men will become more accustomed to their duties :—

1. Mess Orderlies: To fetch the rations from the galley to the messes, wash the pans and crockery, scrub the tables, and keep the mess things clean. They are responsible for the cleanliness of their messes and all property at the daily inspection.
2. Pioneers: To carry food and other materials for the use of the troops from the hold to the galleys and canteens.
3. Swabbers: These may be divided into upper and lower deck swabbers, but will in any case be responsible for the cleanliness of that part of one of the decks to which they are detailed.
4. Sweepers.

Watches.

The troops on board will be told off into three watches and exercised in fire and collision stations. In bugle sounds the watches will be distinguished by 1, 2, or 3 G.'s. One watch is to be constantly on deck under the command of an officer.

Ship's Signals.

The following ship's signals are in general use :—

For fire.—The bell is rung violently, strokes in quick succession.

For collision.—The bell is rung, 3 strokes at a time. The groups in quick succession.

For man overboard,—The steam whistle is sounded, several short blasts in quick succession.

At these signals all buglers will sound the necessary calls.

Daily Routine.

The following is the usual daily routine :—

Bells.	Time.	Bugle Calls.	Meaning.
	A.M.		
4	6.0	Reveillé.	Turn out and stow hammocks.
5	6.30	Rations.	Orderlies draw bread and butter.
..	7.15	Breakfast.	Draw and sit down to breakfast.
..	7.45	Fatigue.	All cleaning fatigues to parade. Troop decks cleared by police.
8	8.0	Guard fall in.	Mount Guard.
3	9.30	Four G's.	Sweepers parade and sweep upper decks.
4	10.0	Assembly.	General parade and inspection of troop decks
5	10.30	Orderly-room.	Orderly-room. Bedding for airing to be brought on deck.
6	11.0	..	Issue of beer. Troops allowed below.
8	Noon	Dinner.	Draw and sit down to dinner.
	P.M.		
1	1.0	Four G's.	Sweepers parade and sweep upper decks. Troop decks cleared by police and swept.
4	2.0	..	Troops allowed below.
2	5.0	Tea.	Troops draw and sit down to tea.
3	5.30	Four G's.	Sweepers parade and sweep upper decks. Troop decks cleared by police and swept.
4	6.0	Warning for parade.	Draw hammocks.
1	6.30	..	Troops allowed below.
1	8.30	Four G's.	Sweepers parade and sweep upper decks.
2	9.0	Lights out Retire.	Stop smoking. Every one, except guard and police, to go below.
..	9.15	..	Rounds. Every man to be in bed.
6	11.0	..	Lights out in saloon.

General Calls.

The following are the general bugle calls :—

Stand fast . . . Silence—every one to remain still.

Continue	Carry on—that is continue your business.
Retire	Every one off upper deck but the guard.
4 G's	Sweepers.
4 G's and Double	Swabbers.
Alarm	Man overboard.
Charge	Permission to smoke.
Lights out	Leave off smoking.
Fire Alarm	Fire.

Fire Precautions.

Practice.

At the earliest moment after the troops have embarked, all men should be told off to their fire stations in accordance with the orders of the captain of the ship. Shortly after this has been done, the alarm should be sounded, and it must then be ascertained that all men are in their places and understand their duties. Each man must also clearly understand to which boat he is detailed.

During the voyage at least two or three "alarms" should be sounded without previous warning.

In the Event of Fire.

Should a sentry or any one else discover fire, he must instantly report to the ship's officer of the watch on the bridge, who will then give the necessary orders. It must be impressed on all officers and men that if a fire occurs, silence and a strict compliance with orders are essential.

Horses on Board Ship.

Ventilation.

On the voyage, ventilation is the chief consideration. The air in portions of the ship is necessarily foul even when there is a head wind and the ship is steaming at 12 or 14 knots, but if the ship is heaved-to, ventilation fails directly. Under no consideration, therefore, should horses be shipped before a vessel is about to start, nor should there be any delay in landing the horses on arrival at the place of debarkation.

If it is not practicable to land all the horses at once, the most crowded and least ventilated parts of the ship should be emptied first. It is courting disaster to stop under any circumstances at intermediate ports, particularly in the tropics.

The effect of foul air is to cause congestion of the lungs. The symptom of this is "blowing," *i.e.* heavy and difficult breathing. If this occurs, loss will be obviated by getting such cases immediately into fresh air under a windsail, or preferably on to the deck, where they should be stalled, if possible, until the blowing ceases.

Heat apoplexy, a condition which is very rapidly fatal, is brought about by intense heat, in addition to foul air. In a crowded ship in a tropical port, 50 or 60 horses may die from this cause in a single day. The only satisfactory remedy is to bring cases immediately on to deck.

Water.

Horses should be watered at least three times daily, and more frequently in hot weather; the allowance of water for a horse being at least eight gallons per day.

It is most important to ensure that sufficient water is given in hot weather, since the withholding of water aggravates the tendency to congestion of the lungs and heat apoplexy.

It should be stipulated in the contract for the hire of the transport that sufficient fresh water must be carried. Condensed water is not fit for horses, and many reject it even when suffering considerably from thirst.

Food.

Throughout the voyage horses should be given as much hay as they will eat, the bulk being given at night. During the first three or four days they should, in addition, be given, say, 6 to 8 lbs. of bran per day. After this, 5 lbs. grain and 5 lbs.

bran per day until, say, two or three days before the end of the voyage, when they should receive their full grain ration.

The daily allowance for each horse on board a transport is —Oats, 5 lbs.; bran, 5 lbs.; hay, 12 lbs.; and for each 100 horses—carrots (or other suitable roots when procurable), 75 lbs.; oatmeal, 1 lb.; linseed, 2 lbs.; rock salt, 6 lbs.

Grooming and Exercise.

Thorough grooming, as well as the hand-rubbing of legs and the sponging of eyes and nostrils, are of consequence to the well-being of a horse on board ship, and should be carried out daily. Clean sea water may be used for sponging the nostrils, lips, and docks, as well as the horses' mangers. Every effort should be made during fine weather to bring horses on deck for exercise.

Stalls.

At least five per cent. of the stalls should be left vacant on transports, half on each side; the horses can then be shifted occasionally, and their stalls thoroughly cleaned out.

Horses, as a rule, are not kept in slings on board. If a sling is necessary, it should hang an inch or so below the horse's belly so that he can rest himself in it when he likes.

A good method to prevent horses injuring themselves is to scatter well-broken cinders in the stalls, which, besides affording a foothold, will absorb the urine; and also to fill corn sacks with straw or any soft material, and hang them up wherever the horses are likely to be injured.

If a horse falls in his stall, loose his head, pull his fore feet out in front of him, place a sack full of chaff or some such thing to give him a purchase. He will then be able to rise with ease.

If a horse falls on deck during a storm and is a source of danger to the others through being thrown about and being unable to rise, his feet should be lashed together and the animal tied securely to some support.

Standing by the Horses.

In very rough weather, or on the alarm of fire, as many men as can be spared should be told off to stand at the horses' heads.

STABLE ROUTINE ON BOARD.

Morning Stables.

Raise platforms, rake and sweep the stalls well out, and sprinkle disinfectants. Water the horses, and sponge out nostrils, eyes, etc. Then feed as ordered.

Mid-day Stables.

Shift horses into spare stalls and on to the deck when practicable; pick and wash out feet, examine shoes, fastening any loose ones. Thoroughly groom the body, hand-rub the legs, brush out mane and tail, and sponge nostrils and face; clean stalls, raise and clean platforms, dry deck underneath and sprinkle disinfectants. When horses are clean, water and then feed as ordered.

Evening Stables.

Rake stalls well out, sweep up, sponge nostrils, etc., as at morning stables, hand-rub legs, water, and then feed as ordered. Stablemen afterwards feed horses with remaining portion of hay.

Disembarkations.

General Directions.

Disembarkations are carried out in a similar manner to embarkations, but, of course, in the reverse order. Owing to the difficulty of getting men to descend ladders quickly and get into boats, frequent rehearsals should take place, especially prior to a contemplated landing under cover of darkness.

In order that the men should not have to leave their horses after disembarkation, it is better that everything belonging to the men and horses should be taken out of the ship before the horses are landed.

Troops should have a meal one hour before landing.

Boat Orders.

For Naval Terms, see pp. 486, 488.

The following orders should be strictly adhered to in all "boat drills."

(1) Oars and gang-planks should be laid in the centre of the boat. Rifles must not be loaded. Rifles and entrenching tools should be carried in the hand, unless a rope ladder or sea gangway is being used, when rifles should be slung over one shoulder.

(2) Men detailed as rowers will enter the first boat, sit down, and place their rifles on their outer hand, leaning forward, towards the bows and against the thwarts on which they are seated. They will then "Toss their oars."

(3) It is important that sections, led by their officers and non-commissioned officers, should enter the boat and at once seat themselves together, according to the order in which they are to disembark. All men, except the rowers, must sit "at attention," with their rifles between their knees.

(4) When the boat beaches, rowers will let their oars go overboard if they are secured by lanyards, otherwise they should boat them, and the "bowmen," or other men specially told off for the duty, should jump overboard at once and ship the gang-plank.

(5) Officers and men embarking or disembarking by means of a gang-plank should move steadily and not at the double, and ropes or boat-hooks should be held by the bowmen to assist them.

(6) The naval officer or petty officer in charge of the boat is responsible both for the boat and its contents, therefore military officers and non-commissioned officers will take instructions from him. Orders to rowers will be given direct.

(7) No lights are to be struck or smoking allowed.

(8) An officer should accompany each boat.

(9) Men are to be warned not to step on the gunwales of small boats, and to keep their hands off the gunwales *always*.

(10) Equipment should not, if possible, be worn, but, if worn, shoulder-straps should be undone to allow men to slip off their accoutrements if they fall into the water. If the boat is likely to be upset, water bottles should be unslung and waist-belts undone.

(11) All units must re-form directly they land, and in case of a covering force they must move at once to their places in the firing line or supports. Clear orders as to formations should be issued before disembarkation.

DISEMBARKATION OF HORSES.

The ordinary head-stall and bridoons should be put on before the horses are disembarked, and when the horses have to be slung out of the vessel, the ship's head-collar should also be kept on until the horses are on shore.

1. *On to a Wharf.*

If horses are to be landed on a wharf, straw or sand should be laid down so as to save the horses from falling when they touch the ground, or, at all events, lessen the effect if they fall.

2. *Into Boats.*

When horses are landed in boats or flats, great care is necessary in lowering from the vessel, especially if there is any swell. The tackle of the sling must be let go the moment the horse reaches the boat, so that he may be able to get his footing. He must also be lowered into the boat facing either the bow or the stern. In order to save confusion on the shore, horses should be harnessed or saddled, as the case may be, before they embark in the boats.

On nearing the shore, if no piers or landing-stages are available, or if the stern of the boat cannot be let down to provide a gangway, the horses must be made to jump out of the boats. It is almost needless to say that this is a very undesirable procedure, and should not be resorted to if any other plan can be arranged.

3. *Swimming Horses Ashore.*

When horses are to be landed by swimming, each horse should be lowered in the sling over the side of the vessel without fastening the breast rope or breeching. When the tackle is unhooked, the sling opens, and is at once slipped from under the horse. Care must be taken that the horses are lowered gently into the water and not dropped in out of the slings, and also that there are no loops in bridles, head ropes, or chain, in which they might become entangled, since many horses have been drowned in this way. The neck-rope should be hauled up and secured, and the horse's head supported as directed on p. 492. If necessary, four horses can be made to swim ashore in this manner at once, two on each side of the boat.

If a boat is not available and the distance to the shore is not great, the horses may be allowed to swim ashore by themselves. If this is done, a number of horses should be kept on the beach, so that those in the water may see them and swim towards them.

DISEMBARKING ARTILLERY, TRANSPORT WAGONS, AND PONTOONS.

Artillery, transport wagons, and pontoons are disembarked either direct on to a wharf or into boats for conveyance ashore in exactly the opposite order to that in which they are embarked, as described on p. 493.

Time between Transports being sighted and actual landing.

The amount of time which may be expected to elapse between the moment the transports are first sighted by persons standing on shore and the actual landing of troops is from 2 to 3 hours, roughly estimated as follows :—

From sighting to anchorage .	1 hour
To anchor and out boats . .	½ ,,
Boats to load and form up . .	¾ ,,
Landing	½ ,,

Covering Party.

If landing on a hostile shore, a covering party consisting probably of infantry and cyclists with some machine guns, would land first, possibly under cover of darkness, to seize some suitable ground from which they can cover the landing of more troops. As further bodies are landed, including artillery, the covering force will be pushed further inland so as to render the landing more secure.

As to heads of a reconnaissance report on a coast for the purposes of landing, see pp. 112, 113.

Beach Party.

To assist in the landing, a beach party will be detailed, partly from naval officers and men and partly from army officers and men.

For a pair of landings, the naval beach party would consist of about 6 lieutenants, and sub-lieutenants, 50 petty officers and men, while the military beach party would consist of a military landing officer, an assistant military landing officer and about 60 N.C.O.'s and men.

Boat and Working Parties.

A naval party, assisted possibly by a military party, will be told off to work the boats.

Working parties will in addition be required for work in the holds and to pass the stores into boats.

Identification Marks.

It will be found convenient for each of the boats which are to land at a particular spot to carry a flag of a distinctive colour, and for the beach party at that spot to plant on the shore a flag of the same colour. If landing at night, shaded lights which can be seen only from the sea may be used by those already on shore.

ROAD TRANSPORT.

I. MARCH FORMATIONS, TIME AND SPACES.

Home.

(*a*) *March Formations.*

The normal march formations on a road are :—

For Cavalry : column of sections or half section, *i.e.* 4 or 2 men abreast.

For Artillery : column of route, *i.e.* guns and wagons in single file.

For other mounted troops : column of fours or of files.

For infantry : column of fours.

(*b*) *Intervals between Units on the March.*

To prevent minor checks in a column being felt throughout its length, the following distances will be maintained :—

In rear of a Section of Field Company or Signal Company	6 yards
In rear of a Battalion, Squadron, Battery or Infantry Company	10 yards
In rear of a Cavalry Regiment or Artillery Brigade	20 yards
In rear of a Cavalry or Infantry Brigade	30 yards
In rear of a Division	According to circumstances.

(*c*) *Pace.*

On a good road, an Infantry Column should maintain a regular pace of 1 miles in 18 minutes. Including short halts, an Infantry Brigade should average 3 miles per hour.

Mounted troops marching independently, at the trot and walk, including short halts and leading, should average 5 miles per hour.

Rates of movement in the field are approximately as follows :—

Arms.	Yards per minute.	Minutes required to traverse 1 mile.
Infantry	98	18
Mounted Troops—		
at walk	117	15
at trot	235	8
at gallop	440	—

(*d*) *Time and Space.*

In a movement to a starting point, it may be taken that all troops, mounted and dismounted, march at the rate of 100 yards per minute.

Unit.	Space covered in Columns of Route with 1st Line Transport.
Cav. Regt. in sections or fours	1 yard per horse in the ranks.
Cav. Regt. in half-sections or files	2 yards ,, ,, ,,
Infantry Battalion in fours	1 yard per 2 men ,,

Allow :—

For each 1 or 2-horse vehicle	10 yards	Including 4 yards between each vehicle.
,, ,, 4-horse vehicle	15 ,,	
,, ,, 6-horse vehicle	20 ,,	
,, pack animals (except camels)	4 ,,	in single file.
,, Camels	6 ,,	,, ,, ,,
,, M.T. lorry	8 ,,	,, ,, ,,

For M.T. Convoy on the march allow from 20 to 100 yards per vehicle according to whether convoy is fully extended or not.

The following are approximately the spaces required by different bodies of troops and their transport when marching by road. Though allowance has been made for the regulation distance between units on the march, none has been made for opening out. No allowance made for motor-cars or cycles.

Unit.	Road Spaces.		Total.
	Fighting troops and transport	Ambulances and trains.	
Cavalry.	yds.	yds.	yds.
1. *Cavalry Brigade* (with Cavalry Division)			
Headquarters	95	. .	95
3 Cavalry Regiments . . .	1050 each	. .	3150
1 Signal Troop	75	. .	75
			3320
2. *Cavalry Division*			
Headquarters	130	. .	130
4 Cavalry Brigades	3320 each	. .	13,280
Cavalry Divisional Artillery			
Headquarters	50	. .	50
2 H.A. Brigades	2030 each	. .	4060
Cavalry Divisional Engineers			
1 Field Squadron.	590	. .	590
Cavalry Divisional Signal Service			
1 Signal Squadron	625	. .	625
Cavalry Divisional Medical Units			
4 Cavalry Field Ambulances .	. .	290 each	1160
Hdqrs. Cavalry Divisional A.S.C.	60	. .	60
			19,975

Unit.	Road Spaces.		Total.
	Fighting troops and transport	Ambulances and trains.	
	yds.	yds.	yds.
3. *Cavalry Squadron*	255	..	255
4. *Cavalry M.G. Section*	165	..	165
5. *Cavalry Brigade* (with attached troops) not allotted to a Cavalry Division			
Headquarters	95	..	95
3 Cavalry Regiments	1050 each	..	3150
1 H.A. Batty. and Amm. Col.	990	..	990
1 Field Troop	200	..	200
1 Signal Troop	135	..	135
1 Cavalry Field Ambulance	..	290	290
			4860
Infantry			
1. *Infantry Brigade*			
Headquarters	65	..	65
4 Battalions	800 each	..	3200
			3265
2. *Infantry Division*			
Headquarters	100	..	100
3 Infantry Brigades	3265 each	..	9795
Divisional Mounted Troops			
1 Cavalry Squadron	255	..	255
Divisional Artillery			
Headquarters	45	..	45
3 F.A. Brigades	2090 each	..	6270
1 F.A. (howitzer) Brigade	1905	..	1905
1 Heavy A. Battery and Ammunition Column	510	..	510
1 Divisional Amm. Column	2400	..	2400

Unit.	Road spaces.		Total.
	Fighting troops and transport.	Ambulances and trains.	
	yds.	yds.	yds.
Divisional Engineers			
Headquarters	40	..	40
2 Field Companys	490 each	..	980
Divisional Signal Service			
1 Signal Company	420	..	420
Divisional T. & S. Unit			
1 Divisional Train	..	1755	1755
Divisional Medical Units			
3 Field Ambulances	..	380 each	1140
			25,615
3. *Infantry Company*	140	..	140
4. *Battalion M.G. Section*	30	..	30

Australia.

These vary from year to year. Where units reach war establishment the calculation will be the same as above.

II. ORGANIZATION OF ROAD TRANSPORT.

DIVISION OF TRANSPORT.

Road Transport is divided into two main sections, namely:—

1. Transport with Field Units;
2. Transport on the Line of Communications.

1. The Transport with Field Units of the Expeditionary Force is subdivided into two classes, namely:—

(*a*) The transport of fighting units, and

(*b*) The transport of administrative units, *i.e.* field ambulances, cavalry field ambulances, supply columns, and parks. (See p. 514) (*a*) The transport of fighting units in the Expeditionary Force is again subdivided into—

(*a*) First Line Transport;
(*b*) Trains.

The first line transport consists of gun carriages; ammunition wagons; pack animals, limbered or G.S. wagons or carts carrying ammunition, tools, machine guns, technical stores or medical equipment, telephone wagons, water carts, travelling kitchens or other vehicles for cooks, and in the case of the Cavalry Division and Cavalry Brigade also of the baggage wagons.

Trains are allotted to Divisions and Army Troops for the conveyance of baggage, stores and supplies.

Transport in the Territorial Force is subdivided into—

(*a*) First and Second Line Regimental Transport;
(*b*) T. and S. Columns and Field Ambulances;
(*c*) T. and S. Parks (if allotted).

The First Line Transport of the T.F. corresponds to that of the Expeditionary Force excepting that water carts, field kitchens, vehicles for cooks and the baggage vehicles of the mounted formations are not included in the term.

Second Line Transport of the T.F. corresponds to the train of the E.F. excepting that in the term the water carts and the baggage vehicles of mounted formations are included.

2. Road Transport on the Lines of Communications is divided into 3 classes, namely:—

(*a*) Supply Columns, Ammunition Parks, Reserve Parks and Clearing Hospital Transport (if allotted) which form the connecting links between railheads and the transport with Field Units.
(*b*) Transport to supplement the railway, and working between the base and railheads.
(*c*) Local transport for duty at the bases or at posts on the Lines of Communication.

Transport under headings (*b*) and (*c*) will be organised according to requirements by Transport Depôts on the Lines of Communication by hire, purchase or impressment.

Such Depôts will be established at the base and at suitable places on the Line of Communication. They are responsible for the collection of transport personnel, animals, harness, stores, etc., and to organise same into transport as required.

Reinforcements in Horse Transport and Supply Personnel are in the first instance located at the Base Horse Transport Depôt, reinforcements in Mechanical Transport personnel at the Base M.T. Depôt.

1. Transport with Field Units.

Composition.

Transport with Field Units consists of the following :—

Headquarters : Maltese carts for medical equipment.
Forage carts for lithographic and technical equipment, telephone detachments, etc. ;
Printing wagon ;
Motor cars ;
Pack animals for telephone, medical, and veterinary equipment ;
Spare horses.

Cavalry : Maltese carts ;
Pack animals for scouts and veterinary equipment ;
Limbered wagons for S.A.A., machine guns, tools, and signalling equipment ;
Spare horses.

Infantry : S.A.A. Carts :
Maltese carts for medical equipment ;
Limbered G.S. wagons for machine guns and tools ;
Pack animals.

Artillery and Ammunition Columns	Gun Carriages with limbers; Maltese carts for medical equipment; Cable carts for telephone equipment; S.A.A. carts; Ammunition wagons; Pack animals with veterinary equipment; Spare horses.
Field Company (R.E.)	Pontoon wagons; Trestle wagons (15 yards bridge); G.S. wagon carrying technical stores, baggage and supplies; Double Tool carts; Forage carts for technical stores; Pack animals; Spare horses.
Divisional Telegraph Company:	Cable carts; Spare horses.
Air-line Telegraph Company:	Cable carts; Spare horses.

Position on the March.

Transport with Field Units, other than led horses, always accompanies its unit. Led horses usually follow immediately in rear of the combatant troops.

2. Order of March of Transport.

Transport with Field Units, usually accompanies its unit. In the case of Cavalry, however, any Transport not required for fighting purposes is generally formed into a separate echelon or group, and marches in rear of the combatant troops.

The water carts, field kitchens and vehicles for cooks of divisions are also sometimes formed into separate groups, and march in rear of Infantry Brigades and similar formations.

TABLE OF TOOLS AND EXPLOSIVES CARRIED ON THE PERSON AND IN 1ST LINE TRANSPORT.

Tools.	Cavalry Regt.	Horse Artillery Brigade.	Field Artillery Brigade, 18-pr.	Field Artillery (Howitzer) Brigade.	Horse Artillery Battery.	Field Artillery Battery, 18-pr.	Field Artillery (Howitzer) Battery.	Heavy Artillery Battery.	Horse Artillery Battery Column (*b*).	Heavy Artillery Battery. Ammunition Column.	Royal Engineers.			Infantry Battalion.	Hd. Qrts. Infantry Brigade.	Remarks.
											Field Troop.	Field Company.	Bridging Train.			
(*a*) *Entrenching.*																
Shovels	18	84	126	..	30	30	..	16	12	8	37	111	40	110	568	(*a*) 88. 4½lb., 19, 8lb.
Spades	—	12	18	144	6	6	36	—	—	—	7	19	40	—	—	
Pickaxes	12	48	72	72	18	18	18	8	6	4	39	107(*a*)	40	76	368	
(*b*) *Cutting.*																
Axes, felling	13	12	18	27	6	6	6	—	—	—	25	47	40	16	—	(*b*) For a Cavalry Brigade not allotted to a cavalry division.
Axes, hand	7	—	—	—	—	—	—	—	—	—	14	28	—	8	1	
Hooks, bill	12	48	72	72	18	18	18	8	6	4	18	39	40	40	—	
Hooks, reaping	36	74	58	46	12	12	12	12	24	2	6	10	8	20	—	
Saws, cross-cut	—	—	—	—	—	—	—	—	—	—	2	4	—	—	—	
Saws, folding	3	—	—	—	—	—	—	—	—	—	4	8	—	32	3	
Saws, hand	4	36	54	54	12	12	12	8	6	4	16	27	4	—	—	
(*c*) *Miscellaneous.*																
Crowbars	3	2	1	1	—	—	—	4	1	1	6	8	—	8	9	
Sandbags	150	—	—	—	—	—	—	—	—	—	264	852	—	—	—	
Explosives.																
Guncotton (including primers) lbs.	105	—	—	—	—	—	—	—	—	—	292½	570	—	—	—	

WAGON AND CART EQUIPMENT.

(i) 1 pickaxe, 1 felling axe, 1 billhook, in addition to the tools shown in the Table, are carried as part of the wagon or cart equipment of all G.S. and G.S.R.E. wagons and Maltese carts. These tools do not form part of the equipment of R E. technical vehicles.

(ii.) 1 pickaxe, 1 shovel, and 1 billhook are carried with each machine gun as part of its equipment.

(iii.) 80 sandbags per cavalry regiment and infantry battalion are carried for use with machine guns.

(iv.) 1 pickaxe, 1 felling axe, 1 billhook, and 1 spade are carried as part of the wagon equipment of telephone wagons.

Trains and Second Line Transport normally march in rear of combatant troops.

Position during Advance.

Generally speaking, when there is no likelihood of a collision with the enemy, the smaller the distance that intervenes between trains (or Second Line Transport) and the main body towards the end of the march the better, as the baggage, stores and supplies carried on this transport is required as soon as the troops reach their destination.

When there is a possibility that the enemy may be met, all other considerations must give way to the requirements of the military situation, and transport must not follow the main body so closely as to hamper its movement.

Position during Battle.

Water carts, field kitchens and cooks' vehicles (also baggage vehicles in case of Cavalry Brigades) should be assembled at suitable places in rear of fighting troops under orders issued by Brigade or Superior Commanders.

Trains should be assembled in formations which will enable them to advance or retire at a moment's notice, in positions (normally not less than 5 miles in rear of fighting troops) under orders of Divisional or superior Commanders.

Position during Retreat.

During a retreat the trains (or Second Line Transport) will usually march in advance of the main body.

3. Organization and Duties of Trains and Reserve Parks.

Trains.

Trains are allotted to Divisions and Army Troops for the following purposes :—

(*a*) Conveyance of baggage and stores for units ;
(*b*) Conveyance of supplies from Refilling Points to units;

(*c*) Provision of farriers, wheelers and saddlers to carry out minor repairs to transport of units not having artificers on their establishments;

(*d*) Provision of Transport conducting Personnel;

(*e*) Provision of Supply Personnel for the conduct of Supply Services (including Requisitioning Services).

To each Train are also attached:—

A Field Post Office (with 1 G.S. wagon);
A small Medical Detachment, and
2 Veterinary Officers.

Divisional Train.

A Divisional Train consists of:—

Headquarters;
Headquarters Company;
No. 2 Company;
No. 3 Company;
No. 4 Company.

Headquarters consist of:—

O.C. Train (who acts as Senior Transport Officer);
Adjutant;
Senior Supply Officer;
R.A.M.C., a Veterinary Personnel, and
Field Post Office.

Each of Nos. 2, 3 and 4 Companies undertake the conduct of Supply and Transport Services for an Infantry Brigade and a Field Ambulance.

The Headquarters Company undertakes these services for the remainder of the Division.

Each Company is subdivided into:—

Company Headquarters;
Baggage Section;
Supply Section.

The Company Headquarters find Brigade (respectively Divisional Troop) Supply, Transport and Requisitioning Officers, as well as Transport Artificers to maintain Brigade Transport in serviceable condition, and Transport N.C.O.'s and spare men to undertake the conduct of Transport.

The Baggage Section consists of Transport to convey baggage and stores of units. Separate vehicles are allotted to units.

The Supply Section conveys supplies for units. Each unit has a separate vehicle allotted for this purpose.

Each unit is responsible for the mobilization of the vehicles of the baggage and supply sections allotted to it, and this transport accompanies the unit to the area of concentration, to be used by the unit for Supply and Transport purposes during concentration.

When concentration is completed, this transport is collected from the various units by the Divisional A.S.C. to form the train.

When so collected each unit details one man per vehicle for permanent escort and loading duties.

The Army Troops Train is similarly organized.

Reserve Parks.

Reserve Parks are allotted to the Expeditionary Force for the purpose of safeguarding supply in the event of a breakdown of the railway or of the Mechanical Transport.

Each Reserve Park carries 45,000 iron rations and about 20,000 grain rations, or rather more than 2 days' supplies for a division.

During an advance Reserve Parks generally follow behind the army with an interval of about 1 day's march.

Organization of A.S.C. Services with Cavalry Division and Cavalry Brigade.

Trains are not allotted to a Cavalry Division or to a Cavalry Brigade. Transport for the conveyance of baggage is included in the Regimental First Line Transport of units.

There being no train, Brigade Supply and Requisitioning Officers and their personnel are attached to Cavalry Brigade Headquarters. This personnel is under the command of the commander of the Cavalry Divisional A.S.C., which forms a separate unit finding drivers for Headquarters' units and Cavalry Field Ambulances, as well as Supply and Requisitioning personnel for Cavalry Divisional Troops.

Territorial T. and S. Column.

A T. and S. Column is allotted to each Territorial Division and Mounted Brigade.

The organization of a Divisional T. and S. Column is similar to that of a Divisional Train with the following exceptions :—

(i) There is no baggage section in the Divisional T. and S. Column for the conveyance of baggage and stores for units, as the latter have transport allotted for the purpose in the Second Line Regimental Transport.

(ii) Supply details do not include Requisitioning Detachments.

(iii) Vehicles allotted for the conveyance of supplies are not permanently allotted to units, as the latter are already equipped with Second Line Regimental Transport for the purpose.

(iv) A Field Post Office is not allotted.

(v) Up to 50 per cent. of the transport of a T. and S. Column may for the present be Mechanical Transport.

Organization of Mechanical Transport.

Supply Columns.—M.T. Supply Columns are allotted to the Expeditionary Force on the scale of :—

1 for a Cavalry Division ;
1 for a Cavalry Brigade not allotted to Cavalry Division ;
1 for each Division ;
1 for Army Troops.

The Cavalry Supply Column consists of :—

Headquarters	2 M.T. Companies A.S.C.
No. 1 Section	
No. 2 Section	

Headquarters consist of the Commander, the Mechanical Sergeant-Major, the Company Sergeant-Major, 2 Staff Sergeants, cleaners, spare drivers, batmen and the workshop personnel (including 2 officers).

Each of Nos. 1 and 2 Sections provide Mechanical Transport for the conveyance of 1 day's supplies from Railheads to the troops, or to First Line Transport (cooks' vehicles and baggage wagons) of the latter. Included in each Section are also Supply details to undertake the loading and issuing of supplies.

Headquarters and workshops generally remain at Railheads, whilst each section conveys a day's supplies to the Division on alternate days.

The transport provided for workshops is Steam Transport; that for the conveyance of supplies consists of petrol-driven lorries.

A Postal Lorry for the conveyance of mails from Railheads to troops, 4 lorries carrying artificers and tools for the performance of minor repairs on the road, and 15 spare lorries are also allotted to each of Nos. 1 and 2 Sections.

For table giving total number of lorries see p. 519.

The Supply Column for a Cavalry Brigade not allotted to a Division is similarly organized into :—

Headquarters	1 Company A.S.C. (M.T.)
No. 1 Section	
No. 2 Section	

A Divisional Supply Column is subdivided into :—

H.Q. and workshops (steam transports)	1 Co. A.S.C. (M.T.)
Transport for conveyance of 1 day's supplies (petrol-driven lorries)	

In other respects the organization is similar to that of Cavalry Supply Column.

TRANSPORT TABLES FOR SUPPLY COLUMNS.

Cavalry Supply Column :

H.Q. and workshops	1 Motor car. 4 Motor cycles. 11 tractors (steam). 11 trucks.
No. 1 Section.	
Postal services	1 lorry.
Supplies	54 lorries.
First-Aid Repairs	4 ,,
Spare	15 ,,
Motor-cars	2
Motor cycles	3
No. 2 Section.	
Postal Services	1 lorry.
Supplies	54 lorries.
First-Aid Repairs	4 ,,
Spare	15 ,,
Motor cars	2
Motor cycles	3

Supply Column for Cavalry Brigade not allotted to Cavalry Division :

H.Q. and workshop	Motor Car	1
	Motor Cycles	4
	Tractors (Steam)	3
	Trucks	3
No. 1 Section	Postal Services	1 lorry.
	Supplies	13 lorries.
	First-Aid Repairs	1 lorry.
	Spare	3 lorries.
	Motor Car	1
	Motor Cycles	3
No. 2 Section	(Same as No. 1 Section.)	

Divisional Supply Column :

Postal Service	1 lorry.
Supplies	27 lorries.
First-Aid Repairs	3 ,,
Spare	7 ,,
Motor-Cars	2 ,,
Motor-Cycles	7 ,,
Workshop tractors	3 ,,
,, trucks	2 ,,
Store trucks	1 ,,

Convoys.

Three Systems.

It is laid down in "Field Service Regulations" that Convoys may be arranged on one of the following three systems :—

1. *Through System.*

Under the "through" system of convoys, as it is called in the "Manual of Frontier Warfare," direct convoys transport the material from the depôt to the force for which it is intended without any change of animals or vehicles.

Though this system will, according to the Manual, be rarely adopted in Frontier Warfare, it was very much in use in South Africa, and has been used in many other wars. It is especially suited for the transport of supplies from advanced depôts to the force in the field.

2. *Staging System.*

Under the "Staging" system, the roads along which the convoys are to proceed are divided into stages of appropriate length. One section of the transport is allotted to each stage, and after being loaded at the beginning of the stage proceeds to the end of it. After being unloaded, it returns again to the beginning.

Amongst other occasions, this system was used largely in the last Afghan War; but, except in Frontier Warfare, both the staging and meeting systems are more suited to the Lines of Communication.

3. *Meeting System.*

Under the "Meeting" system, two sections of transport, one of which is loaded and the other unloaded, meet at some point halfway between two stages, exchange their vehicles or transfer their loads, and then return to their respective stages.

It will be seen that this system can be used in conjunction with the staging system.

Advantages of "Through" System.

1. No special organisation or arrangements are necessary.
2. Wagons need not be unloaded or teams exchanged. Consequently stores are not so liable to loss and damage, nor are fatigue and labour parties required.

Advantages of Staging System.

1. Daily journeys of greater distance can be made, because wagons return empty.
2. Stores can travel day and night if stages are so arranged.
3. Personnel get to know roads thoroughly.

Advantages of Meeting Systems.

Additional to Staging System.

Animals and men return to their homes each night, and so have greater comfort. Food and forage need not be carried.

Marches.

Marches should be commenced, if possible, shortly after daybreak and completed before dark. If the weather is hot, there should be a long halt in the middle of the day, during which the animals can feed. S.A. ox transport would generally march by night, the animals grazing by day.

For General Rules on the March, see p. 527.

Halts.

Long halts should not be made during the march unless the animals can be outspanned.

Formations in Camp, and when attacked en route.

If there is any likelihood of attack, laagers should be formed when the convoy is halted for the night, the wagons being placed in a hollow square either axle to axle, end to end, or in echelon. To increase the protection, a trench can with advantage be made outside the laager, a space of not less than 5 yds. being left between the wagons and the ground held by the escort. Another course is to take up a defensive line outside the laager. If, however, the escort is small compared with the number of wagons, the best course to adopt is to place half of the escort in a small entrenched position at one corner of the laager and the other half at the opposite corner.

The methods of forming a laager for a temporary halt or for one night are shown in Plate 32, p. 523. The formation usually adopted takes the shape of a square.

All the animals should of course be placed inside the laager, but latrines and cooking places must be kept outside. Care must be taken that no fires are lighted close to the wagons. If there is no chance of attack, wagons are parked in columns at close intervals.

If the convoy is attacked on the line of march, the formation adopted must depend, of course, on whether the country is open or enclosed. If the country is open, the formation may be that shown in Plate 32.

If the country is enclosed and the convoy moving by a road, the wagons may be wheeled as shown in Plate 33, p. 524. With teams of 4 horses a road of not less than 25 feet broad is necessary, but with pairs 20 feet is sufficient.

PLATE 32.

FORMATION FOR CONVOY IN CASE OF ATTACK IN OPEN COUNTRY.

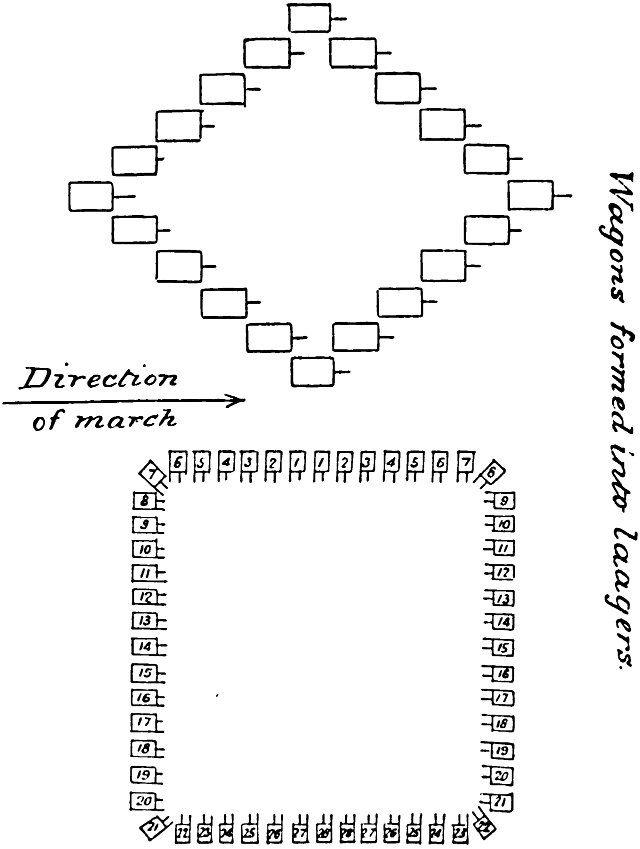

Direction of march
Wagons formed into laagers.
7 6 5 4 3 2 1 1 2 3 4 5 6 7 6
8 9 10 11 12 13 14 15 16 17 18 19 20 21
9 10 11 12 13 14 15 16 17 18 19 20 21 22
22 23 24 25 26 27 28 28 27 26 25 24 23

PLATE 33.

FORMATION FOR CONVOY IN CASE OF ATTACK IN ENCLOSED COUNTRY.

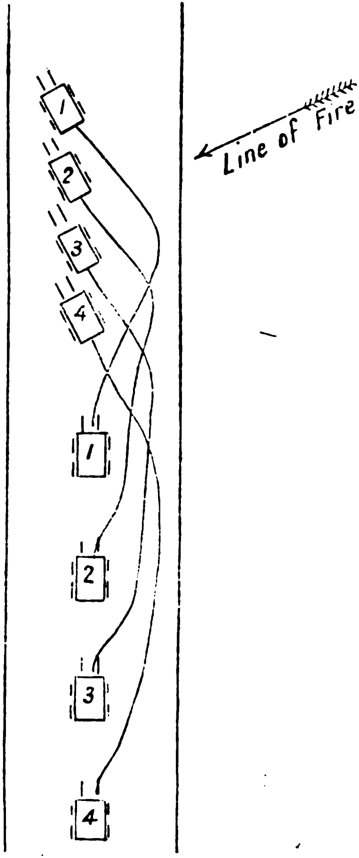
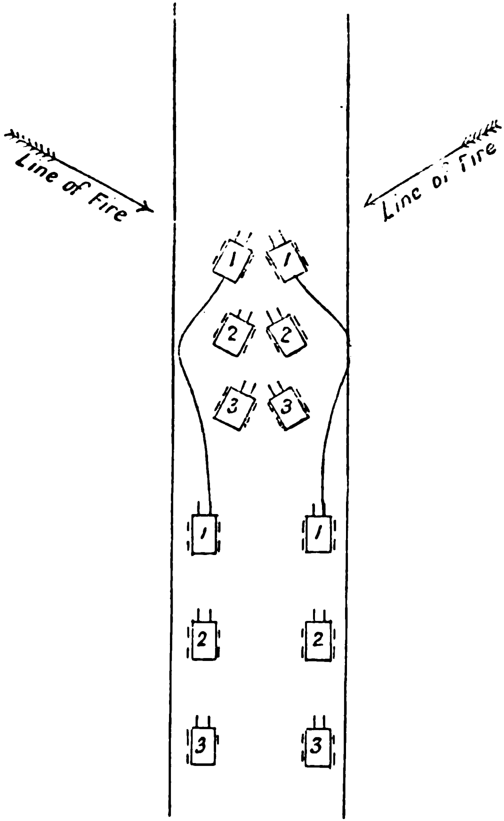

1
2
3
4
Line of Fire
1
2
3
4

PLATE 34.

FORMATION FOR CONVOY IN CASE OF ATTACK FROM BOTH FLANKS IN AN ENCLOSED COUNTRY.


Line of Fire
Line of Fire
1
1
2
2
3
3
1
1
2
2
3
3

Another formation which may be adopted when the attack is from both flanks is that shown in Plate 34. It is necessary, however, where wagons are drawn by teams that the road should be not less than 40 feet broad, though in the case of pair-horse wagons 35 feet is sufficient.

Defence of Convoy.

See p. 247.

III. WORKING OF TRANSPORT.

VARIETIES OF ROAD TRANSPORT.

There may be said to be four different classes of transport, namely :—

1. Wheel Transport : carts and wagons of various descriptions drawn by horses, ponies, mules, bullocks or camels ;
2. Pack animal Transport, *i.e.*, horses, ponies, mules, donkeys, camels, bullocks, or elephants ;
3. Carrier Transport, Coolies, etc. ; and
4. Mechanical Transport.

Comparative Advantages of Each.

Since an animal can draw a far greater weight than it can carry, wheeled transport should invariably be used in preference to pack, whenever the country is at all suitable. For instance, 2 mules can only carry about 320 lbs., exclusive of saddlery, whereas in a light cart they can draw a load of about 900 lbs. In addition to the advantage in carrying capacity, and to the fact that a cart is much easier to load than a pack animal, draught animals suffer far less than pack animals from sore backs and galls.

Carrier Transport should never be used when the employment of any other form of transport is feasible. Owing to the loads being so small it follows that columns of this description of transport must be of great length. Moreover, the carriers are themselves liable to panic under fire, and the possibility of their deserting or refusing to undertake unusual exertions must be taken into account. The loads of carriers may be taken to vary between 40 and 60 lbs.

Mechanical Transport can be employed with advantage where roads are good and where any bridges which have to be crossed will bear the weight of the engines and loaded trucks. For a given load, large engines and trains require less personnel, and occupy less road space, and can be more economically worked than small engines and trains. On the other hand, they are too heavy for ordinary light road bridges, they do more damage to roads, and when they break down involve the stoppage of larger quantities of stores. Consequently the smaller type of engine is usually found more convenient.

Mechanical Transport is of course superior to horse transport for a given load on the main roads, both as regards rapidity and distance covered ; but, on the other hand, it cannot as yet be relied upon for work off the main roads or across country. For European warfare motor transport is the rule.

Rates of March.

The table on p. 528 shows approximately the rate of march per day and hour of different classes of transport.

GENERAL RULES ON THE MARCH OF EACH CLASS OF TRANSPORT.

The following are the general rules which must be observed on the march :—

1. On breaking camp transport with a field unit must be ready to move off with its unit. Should that unit leave the road and the transport be unable to follow, the officer or N.C.O. of the transport must ascertain the road which he is to take. It is, however, the duty of the O.C. unit to maintain touch with his transport.

2. Mention will invariably be made in Orders of the hour and point of start of the trains. As it is important that each vehicle forming that transport should be

	Length in miles of an average day's march.	Average rate mil·s per hour.	
1. Mixed transport—			
Mules and horses .	15–20	3–3½	The length of march as well as the average rate depends on the state and nature of road, weather, distance apart of watering places, etc. As instancing the wide differences which are possible, General von Schellendorff states that a supply column on a good road and under favourable circumstances covered fourteen miles in six hours, but on a bad road and unfavourable circumstances the time occupied was sixteen hours, and under very unfavourable circumstances twenty hours. The rate of march in larger columns will be less than in smaller ones.
Mules, horses, and oxen	15–18	1½–2	
Mules, horses, and camels	15–18	1½–2	
Mules, horses, oxen, and camels . .	15–18	1½–2	
Mules, horses, oxen, camels, and donkeys	15–18	1½–2	
2. Mule transport . .	15–20	3–3½	
3. Horse transport . .	15–20	3–3½	
4. Ox transport—			
Ox wagons . . .	15–18	1½–2	
Pack oxen . . .	15–18	1½–2	
5. Camel transport—			
Trotting camels . .	25–30	7–8	
Pack	15–18	1½–2	
6. Donkeys	15–18	1½–2	
7. Carriers	15–25	2½–3	
8. Mechanical Transport	25–40	4–8	Motor vehicles up to 100 miles if roads are suitable.

ready to take its proper place in the column, and as any delay in this respect will necessarily affect every vehicle starting later, great care must be exercised that all vehicles shall be loaded up shortly before the time when they are due to start.

It may be mentioned that at the beginning of a march on a fair road ten 2-horsed wagons or seven 4-horsed wagons or five 6-horsed wagons will pass a given spot approximately in a minute. Pair horse wagons are now the rule.

3. If there is any chance of the train or convoy being attacked, care should be taken from the very commencement to prevent opening out, and if this has taken place to any extent, every opportunity should be taken to close up either at a halt or on favourable ground. Animals should not be trotted to recover lost distance.

If, however, there is no liability to attack, or if the combatant force is retreating and it is desirable that the roads should be kept as clear as possible, the fastest class of transport, such as mechanical transport, should start first, followed by wagons and carts drawn by horses or mules, then camel transport, and probably ox transport or donkeys last.

In each of these classes of transport the slowest moving team should lead.

4. Before beginning a march the Transport Officer should detail a few carts and wagons carrying light loads to follow in rear of the baggage column, in order to bring on the loads of any wagons that may have broken down.

In the case of mule transport a few spare mules should always be detailed for this purpose.

5. The Transport N.C.O.'s must see that no man rides on any of the transport wagons without the order of a Transport Officer.

6. In order that harness and loads may be adjusted, a halt should be made after the first hour's marching.

Since the passage of bridges and obstacles tends to cause a block, a halt should be made at some distance after passing them, in order to enable the transport to close up before the march is continued.

7. If any bridges, villages, or other obstacles to the free passage of the train have to be passed, it is preferable to pass them before halting for the night, since they will always be more difficult to pass when the train is just beginning its march than when it is in march formation.

If, however, an action is impending, a baggage column should not be allowed to pass through a defile until actually required, since in the event of retreat the return through the defile might prove difficult and embarrassing.

(1) Carts and Wagons.

Carts and Wagons in General Use.

It is impossible to give a full list of the vehicles that have been used by our armies for military purposes in different countries, but a few of those most commonly used are shown below :—

Name.	Country in which used.	Animals by which drawn.	No. of wheels.	Maximum load.	Approximate road spaces.
Forage cart .	U.K.	1 horse	2	10 cwt.	10 yds.
with infantry	,,	2 horses	2	15 ,,	10 ,,
with mntd. troops . .	,,	,,	2	12 ,,	10 ,,
Maltese cart .	,,	1 horse	2	8 ,,	10 ,,
Ox wagon . .	S. Africa	16–26 oxen	4	50 ,,	40–60 yds.
Mule wagon .	,,	8–10 mules	4	20–30 cwt.	23–27 ,,
Scotch cart .	,,	4–6 ,,	2	15–18 ,,	14–18 ,,
Limbered G.S.	U.K.				
wagon with infantry . .	,,	2 horses	4	20 cwt. (27 boxes)	10 yds.
with mntd. troops . .	,,	4 ,,	4		15 ,,
S.A.A. cart . .	,,	2 ,,	2	16 boxes	10 ,,
Filter cart (F.S.)	,,	2 ,,	2	..	10 ,,

PLATE 35.

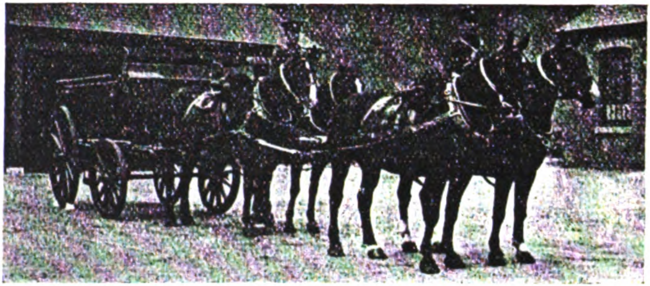
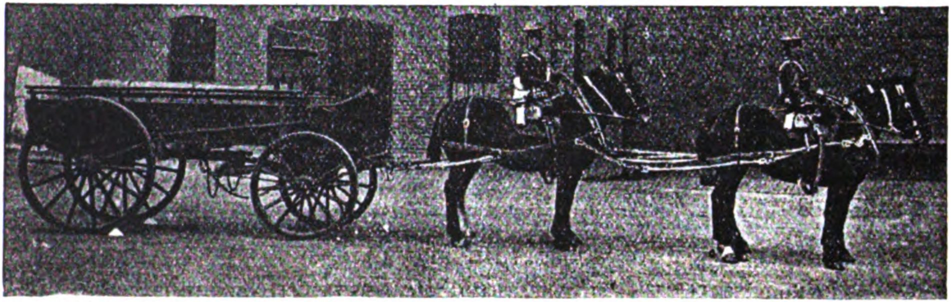


PLATE 36.

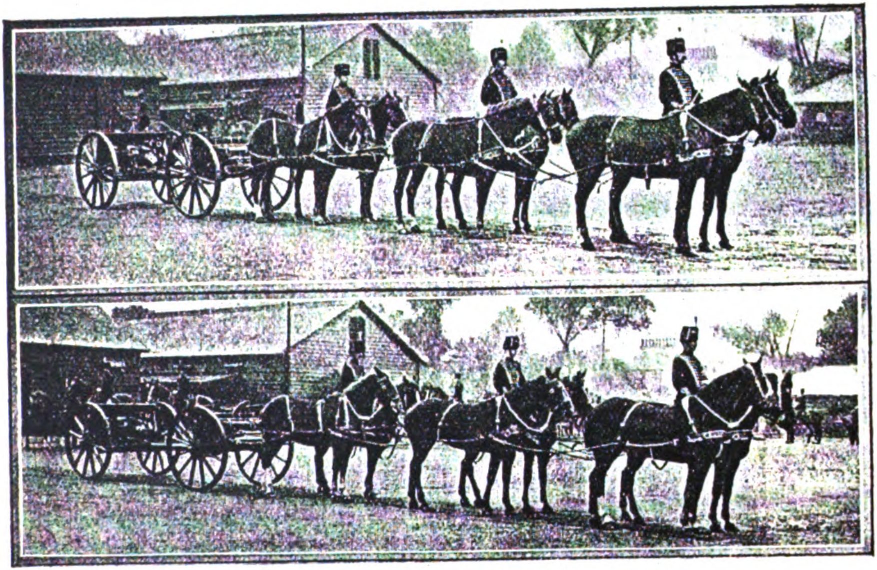


Plates 35 and 36 show how a four-horse team should be harnessed to G.S. wagon. The usual G.S. wagon is now pair-horse.

PLATE 37.

FITTING OF HARNESS AND SADDLERY R.H.A. GUN TEAM.

THE CHESTNUT TROOP.



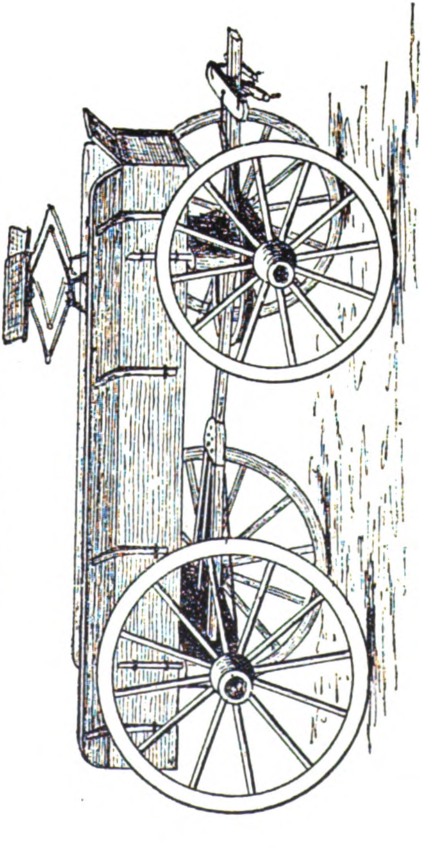
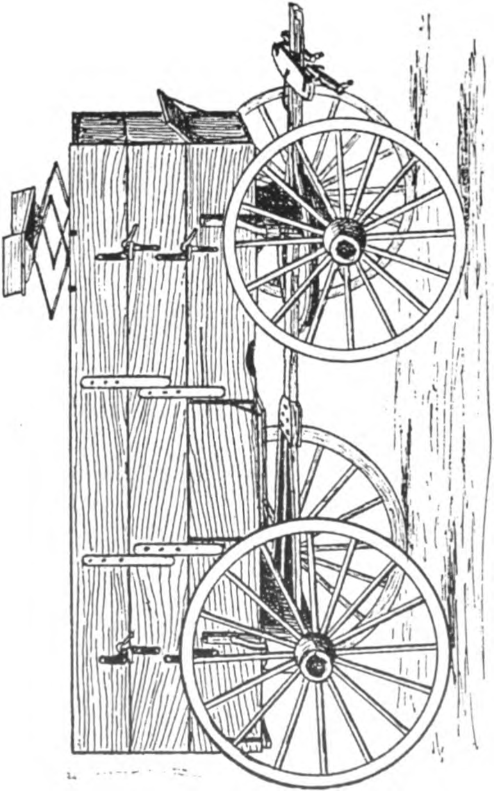


Plate 38.

Standard Canadian Farm Wagon.

PLATE 39.

MANITOBA WAGON.



Infantry in Wagons.

If infantry are to be carried in wagons for any considerable distance, not more than 12 men can in ordinary circumstances be allotted to each G.S. wagon.

Road Spaces.

The road space occupied by each wagon or cart and team are given in the above table. In addition to these spaces from 20 per cent. to 30 per cent. must be allowed for opening out during a march.

Table of Weights.

Weight of some of the Principal Articles of Military Use.

Article.			Weight.		Number which can be carried in G.S. wagon.
			lbs.	oz.	
Ammunition	Box of ·303, charges packed 1000 round per box		80	8	25
	Box of pistol ammunition 276 round		16	8	120
Blankets G.S.			4	8	400
Kettles, Camp, 12 quart			8	8	Cradles 40
Pegs, picketing			1	4	600
Ropes	head		0	13	1500
	heel		0	11	2000
	picketing	4-foot 9 inch	1	1	
		66-foot	8	0	280
		80-foot	17	0	132
Rugs, horse	large		8	8	240
	small		7	0	260
Sheets	field, cavalry, waterproof		2	8	900
	ground		2	9	900
Shovels	G.S.		3	8	640
	universal		5	0	350
Tents, circular, S.L. complete			83	8	28

WEIGHT OF CASES OF SUPPLIES PACKED FOR FIELD SERVICE.

Article.	Gross rate of cases 16.	Number of articles which can be carried in G.S. wagons.	
		With dismounted units.	With mounted units.
Biscuit 50 lbs., 1 cannister in case	70½	42	38
Coffee, 2 cannisters in case . .	71	42	38
Flour, 80 lbs. in bags	82	36	33
Forage compressed—			
Hay compressed, 80 lbs. bale . .	82	36	33
,, ,, ,, ,, (perpetual bale)	81	36	33
Meat preserved, 1's 60 tins in case	75	40	36
,, ,, 2's 30 ,, ,,	72	42	38
,, ,, 1's 40 ,, ,,	52	57	52
,, ,, 2's 20 ,, ,,	50	60	54
*Oats 80 lbs. in bags	82	36	33
Tea, 2 cannisters in case . . .	62	48	43
Vegetables, compressed, 10 5 lb. tins in case	72	42	38

* On home service oats are usually carried in sacks of 100 lbs.

METHOD OF PACKING WAGONS AND CARTS.

(a) *Four-Wheeled.*

In packing a 4-wheeled wagon the heavy articles should of course be placed at the bottom, and as much as possible over the back axle. Articles required first should naturally be loaded last.

The driver of each wagon should be made personally responsible for seeing that his wagon is correctly packed, but he is not himself to carry out the loading. If necessary, fatigue parties must be told off for this duty.

(*b*) *Two-Wheeled.*

In packing a two-wheeled cart the heaviest articles should be placed directly over the axle, and the other articles so distributed that the whole cart will balance as nearly as possible when the shafts or pole are lifted.

Whenever the load is at all high, ropes should be passed over it.

FITTING OF DRAUGHT HARNESS.

Great care must always be taken in the fitting of draught harness. The main points to which attention should be directed are given on pp. 406–417, 557. Reference should also be made to Plates 35 and 36, p. 531.

The flat of the collar should be large enough to allow of the weight being well distributed over the front of the shoulders. It should be fitted so as to allow of the flat of the fingers being inserted at the sides of the collar, and of the hand and knuckles being inserted between the throat of the collar and the breast. In the case of open collars, the hame strap should be tightly drawn in order to prevent the descent of the collar. The hames must be bent to fit the collar.

Under no circumstances should the collar press on top of the neck. In pole draught it is essential to see that the pole chains are not too tight. A serious injury to the top of the neck may occur from pressure due to this cause. Great care is necessary with new collars. By thoroughly damping them and using them carefully in this state, they may quickly be got into shape.

Care must of course be taken that the traces are of equal length.

When horses are hired or requisitioned for transport, it should be seen that their own collars are brought with them.

GRADIENTS AND WIDTH OF ROAD REQUIRED.

Steep Gradients.

A loaded G.S. wagon or cart can under ordinary conditions be drawn up a gradient of 1 in 10. If, however, the condition of the draught animals is very poor, the track bad, or the gradient steeper than 1 in 10, extra teams or assistance are required. The readiest method of supplying this is by manual labour. Five or six men will push as much, roughly speaking, as an ordinary transport horse will pull. *See Table on* p. 570.

Width of Road required for Wagons.

Openings through walls, hedges, etc., made for wheeled transport should, in the ordinary way, be at least 6 feet 10 inches wide. If wagons have to pass one another, or two go abreast, the width should be 18–20 feet.

Form of Drag for carrying Loads on Rough Paths.

In Sweden a form of drag used on rough forest or mountain paths is made of two long poles, of which the rear ends drag along the ground. A few short poles are then fastened transversely and on them the load is made fast.

TEMPORARY REPAIRS TO DAMAGED VEHICLES.

On occasions when assistance from artificers of the Transport and Supply Columns is not available, the following hints as regards repairs to damaged vehicles may be of use. The suggested methods of repairing are only in the nature of makeshifts.

(*a*) *Loose Spokes* :—Wedge emergency spokes between nave and felloe, close to spokes lying opposite one another as at (*a*) (*a*) Plate 40.

(*b*) *Loose dowels* :—Lash the two spokes between the loose dowels and rank up as shown in Plate 40 (*b*).

(*c*) *Slightly Cracked Spokes* :—Strengthen spoke by tightly winding cordage round damaged portion as at (*c*) in Plate 40.

(*d*) *Spokes which are badly cracked* :—Place two bits of iron on either side of damaged portion and secure tightly by cordage as at (*d*) in Plate 40.

PLATE 40.

METHOD OF REPAIRING DAMAGED WHEELS.

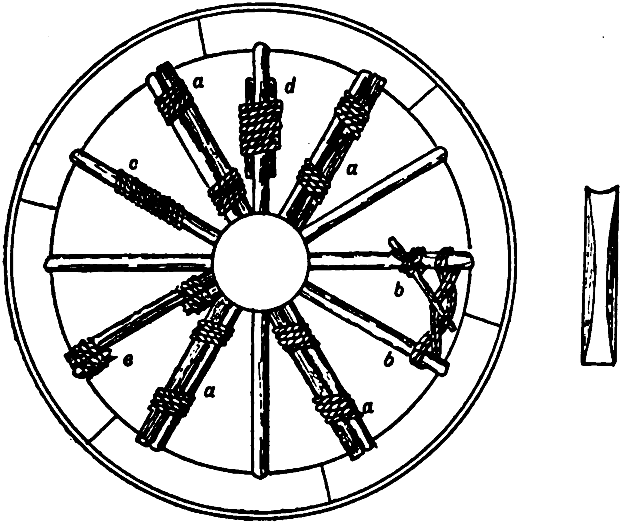


PLATE 41.

TEMPORARY SUBSTITUTE FOR A WHEEL.

FIG. 1.

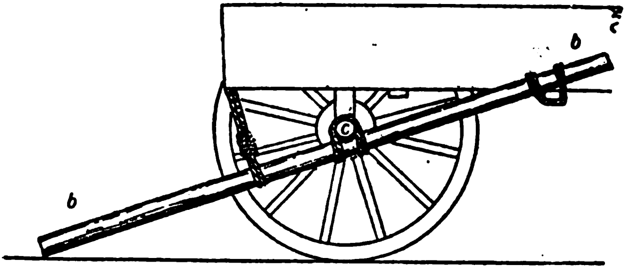


FIG. 2.

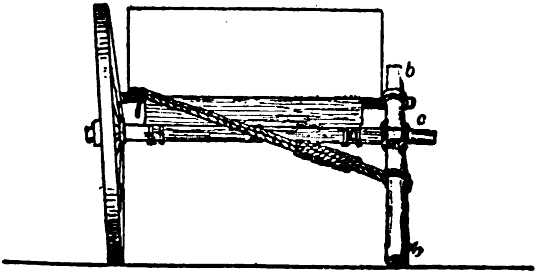
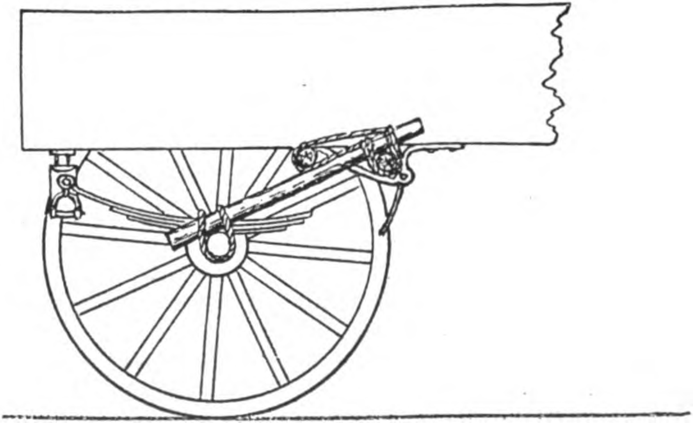


PLATE 42.

SUBSTITUTE FOR A BROKEN SPRING.



(*e*) *Broken spokes* :—Wedge in emergency spoke and secure with cordage as at (*e*) in Plate 40, p. 539.

(*f*) *Broken felloes* :—If a felloe is so damaged that it will no longer support the weight of the wagon when working, turn the wheel so that the undamaged felloe supports the weight, then by means of cordage secure the wheel to the vehicle so that it cannot turn, and place the drag shoe under the wheel. Remove as much of the load as can conveniently be done.

(*g*) Wheels which are so damaged as to be unserviceable may be replaced, if another wheel is not available, by a pole as shown in Plate 41, Figs. 1 and 2. The pole (*b*) is secured at its lower end by cordage to the body of the wagon on the opposite side so as to prevent the cordage at (*c*) slipping off the axle.

(*h*) *Broken spring* :—Service pattern vehicles are, as a rule, springless. Vehicles requisitioned or hired in the country may, however, be provided with springs. Plate 42 shows a method of effecting a temporary repair for a broken spring.

(2) Pack Animals.

General Directions as to Pack Animals.

The following points are useful to remember when dealing with pack animals :—

1. The stuffing of pads must be carefully inspected, and a saddle once fitted to an animal should not be changed. The stuffing of the pads must be renewed if the animal loses condition ;
2. Care must be taken that all loads are evenly adjusted before starting, and that no animals are overloaded. Overloading causes an animal to break down even sooner than long marches ;
3. Since waiting about is most exhausting, care should be taken not to load animals until shortly before the time of marching ;
4. To prevent loads slipping, the breeching should be tightened when descending, and the breast straps when

ascending, hilly country; cruppers must be kept clean and well greased, otherwise the mules will suffer from lacerated docks;

5. Convoys should never be unduly hurried;
6. Loads should always be adjusted at the first halt, because ropes tend to stretch and slacken;
7. The girths of all pack animals should be pulled up tight at first and then readjusted at the first halt;
8. Crooked and bad loads should be readjusted at once, the mules being pulled out of the line for the purpose. It should be impressed on the baggage guard that it is their duty to do this, as the man leading the mules cannot do it himself.
9. Every opportunity should be taken to water animals, but this should not be done within one hour after feeding.

Road Spaces.

The space of 4 yards should be calculated for each pack animal. On a single track it has been noted that 500 mules will pass a given spot in an hour.

Horse and Pony.

Horses are seldom used as pack animals in large numbers, while the ordinary pony is inferior to a mule as a transport animal, owing to the fact that it is more liable to disease and requires more care generally.

Load.

The load of a pack horse, including saddlery, is about 240 lbs.

The load of a pack pony, including saddlery, is about 200 lbs.

Pace.

The ordinary pace at a walk is about 3 miles per hour.

Food and Water.

See Horse Management, p. 395.

Routine in Camp.

See Horse Management, p. 402.

Routine on March.

See Horse Management, p. 400.

Fitting Saddlery.

See pp. 406, 537, 545.

Care of Saddlery.

See pp. 563, 564.

Method of Loading.

See pp. 547–554.

Mule.

The mule is probably the best of all pack animals, requiring less grooming and care generally than either a horse or pony, besides being far less liable to disease, and being almost twice as long-lived; in addition to this, a mule is an excellent swimmer. In mountainous countries it is unsurpassable, owing to its surefootedness and hardihood.

Load.

The weight and dimensions given below should not be exceeded in the case of a mule's load :—

Weight of load, less saddlery . .	160 lbs.
Length of each package . . .	30 inches.
Width " "	15 "
Height " "	20 "

Pace.

The ordinary pace of a mule is 3 miles per hour.

Twitching of the lips is a sign of pain and probably indicates a gall. Dropping of ears is a sign of fatigue.

Food and Water.

Mules require, as a rule, the same forage rations as horses, size for size, but mules are generally able to keep condition on a less generous diet and are not so fastidious as horses.

In India a mule's ration on service is :—

	Grains lbs.	Fodder lbs.		Salt oz.
		Dry.	Green.	
Ordnance mules . . .	6	20	35	½
First-class baggage mules .	6	15	30	½
Second-class ,, ,, .	5	13	25	½

Though a mule will eat almost anything, it is often particular about water, of which it requires about 6 gallons daily. If a mule refuses to drink from a trough or a stream with the others, it should be tried with a bucket of water.

Routine in Camp.

See Horse Management, p. 402.

Routine on March.

Each mule-driver should himself lead his three mules and not fasten them to the animals in front; but on narrow hill roads or paths even the three mules should not be tied together because they may have to scramble up with their loads, and if one mule falls over the side he does not, if loose, drag the other two with him.

Fitting of Saddlery.

Pack Saddles.

The saddle should be placed well in the middle of the animal's back, about a hand's breadth behind the play of the shoulders in front and clear of the hips behind. There should be room for two fingers in front and rear between the backbone and the arch of the saddle, so as to allow free circulation of air along the spine. On no account must the animal's backbone be subjected to any pressure.

Panels.

The panels should be stuffed so as to have an equal pressure on both sides of the back. They should be continually inspected, because after some days' work the animal may become emaciated or the stuffing of the saddle become hard and lumpy, which should be rectified at once.

Girths.

All pack animals, especially mules, should be tightly girthed up, but in no case should the skin be caused to wrinkle. After marching a short time the girths should be inspected because the weight of the load may have caused them to become slack.

The girths of all mules should be looked to immediately after the march has begun, as the animals usually swell themselves out when being girthed up.

Breast Collar.

The breast collar should hang horizontally from the neck straps, the lower edge just clear of the shoulder points. It should on no account restrict the animal's movements, and should be loose enough to admit the breadth of a hand underneath it.

Breeching.

The breeching is fitted in a similar manner to the breast collar. It should be from 10 to 12 inches below the upper part of the dock.

Bridoon.

The bridoon, when buckled to the head collar and placed in the animal's mouth, should just touch the corner of the mouth without wrinkling the skin.

Leading Rein.

The leading rein should be passed through the off ring of the bridoon bit and then through the near ring, thus acting as a curb.

Head Collar.

In fitting the head collar there should be room for two fingers between the animal's nose and the nose band. The nose band should be two fingers' breadth below the cheek bone.

Crupper.

The crupper should be just tight enough to prevent the saddle slipping forward. It should admit the breadth of the hand between it and the horse's croup. Care should be taken that no hair remains between it and the dock.

Collar Chains.

For the purpose of securing mules, collar chains are better than head ropes, which mules are apt to gnaw.

Precautions when Saddling.

Before saddling up, every care should be taken to see that any dried sweat or matted hair is rubbed or combed out, and that the animal's back is clean and free from dirt. The panels of the saddles should be examined and thoroughly dried and beaten. For care of saddlery, see p. 563.

Loading Horses, Mules, and Ponies.

Essential Points in Loading.

The following are the essential points to be borne in mind in loading pack animals :—

(1) The load should be equally divided so as to balance properly ;

(2) If the load is packed too high, it will rock backwards and forwards, while if it is packed too low it will compress the ribs, which are not intended to carry weight, and impede the breathing ;

(3) No part of the load should on any account touch the animal's body ;

(4) Loads should be made as flat as possible so as to lie close to the saddle ;

(5) Girths and surcingle must be tight ; a loose girth allows a saddle to shift.

Methods of Loading Pack Saddles.

Service pack saddles are fitted with hooks on which the

PLATE 43.

Packing loads

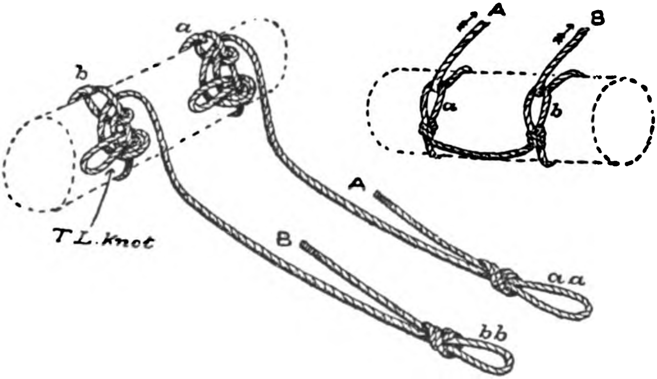


Fig. 2.

Fig. 1.

a
b
T.L. knot
A
B
aa
bb
A
B
a
b

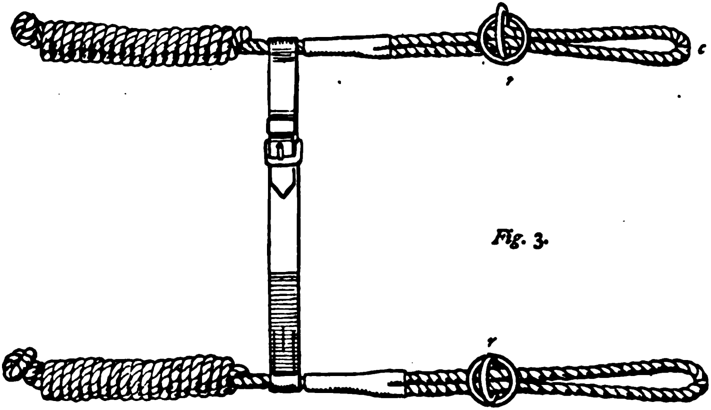


Fig. 3.

loads are slung. Baggage ropes with rings and loops are provided (Plate 43, Fig. 3). The ropes are passed round the load, their ends pulled through the loops *cc*, hauled tight and fastened off. Loads are then slung on the hooks of the saddle by means of the rings *rr*.

When saddles without hooks are provided, the loads may be packed as follows: double the rope and at the doubled end make two ordinary loops *ab* (Fig. 1) at intervals suitable to the load. Place one load on the rope close up to the loops, put the ends through these loops and pull tight, securing with a T.L. (*i.e.* Transport Loop) knot. Then make similar loops *aa*, *bb* at an interval down the rope equal to the breadth of the animal's back, turn the ends AB back over the other load, which should be placed between them and the loops *aa*, *bb*, and pass the ends through these loops, finishing off with T.L. knots. In India the length of a loading rope is 60 feet.

Loading S.A.A. Boxes.

A mule can carry two S.A.A. boxes of 1100 rounds each.

In loading S.A.A. boxes the loading ropes should be tightly lashed round the boxes a few inches from the ends, the rings or loops of the ropes resting on the lower edges of the boxes, so that when loaded the tops will be to the front and thus allow of the slides of the boxes being opened outwards. Care must be taken that the ropes do not in any way interfere with the free opening and shutting of the slides.

Loading Provision Cases.

A mule can carry 2 boxes of preserved meat or biscuits. They should be securely lashed round the sides and ends.

Loading Hard Packages.

In loading hard packages having rough or sharp edges, it is as well to put tufts of straw, hay, or other soft material between the edges of the packages and the ropes, to prevent the ropes slipping or becoming frayed.

Loading Forage.

A mule can carry two bales of compressed forage of about 80 lbs. each.

Forage in the field, which is usually compressed into bales, is loaded in a similar manner to S.A.A. boxes. If the forage is loose, the sacks mentioned on p. 552 can be used.

Loading Camp Kettles.

A mule can carry about eighteen camp kettles of 8½ lbs. each. Cooking-pots are usually nested together and carried in the sacks mentioned on p. 552.

Loading Tents.

A mule can carry two bell tents with their poles, each weighing 83 lbs. complete.

Tents should be packed in their bags, and then placed as high up on the saddles as possible, securely lashed with the loading ropes. The poles should be placed on the top, care being taken that they do not project more than 6 inches in front, in order not to interfere with the free movement of the animal's head and neck.

Loading Blankets, Waterproof Sheets, and Great Coats.

A mule can carry about 36 blankets of 4½ lbs. each, or 62 waterproof sheets of 2 lbs. 9 oz. each, or 22 men's great coats of 7 lbs. 5 oz. each.

These articles can be loaded by folding them the same length, and then making them up into bales, tying these as usual with the loading ropes.

Methods of carrying Entrenching Tools.

There are three methods of carrying entrenching tools on pack animals :—

1st. In tool racks. These are square frames of wood with two parallel iron bars which project slightly outwards and are

PLATE 44.

Methods of carrying Entrenching tools

Fig. 1.

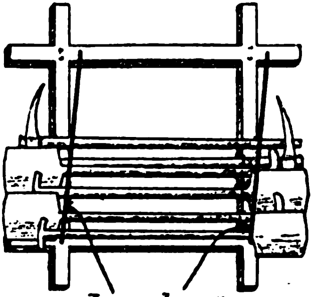


Fig. 2.

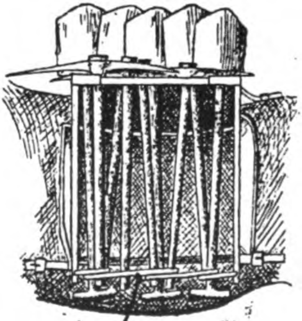
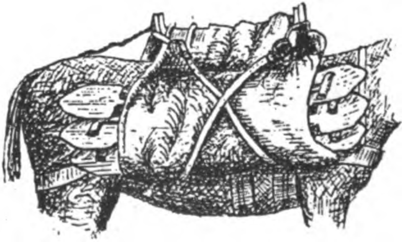

Leather strap

Fig. 3.



fastened at the bottom of the frame on either side as shown in Plate 44, Fig. 1.

The tools are placed horizontally one above the other between the frame and the iron bars, shovels being put in first and the picks above them. When the rack is full, all the tools are strapped in tightly and a broad surcingle buckled over all.

2nd. In ordinary Khajawahs. In these frames the tools (5 pairs of picks and shovels) are placed vertically, blades uppermost, the shovels having their convex sides outwards as shown in Plate 44, Fig. 2; the handles should be interlaced with leather thongs or thin rope.

3rd. In suleethas or canvas pack sheets. When packed in these the picks are knocked off 9 of the helves, slid on to the helve of the 10th pick and interlaced with a thong of leather; this pick and the other 9 helves are placed head downwards in the near side of the suleethas, the shovels being in the offside, horizontally and alternately head and handle, as shown in Plate 44, Fig. 3.

Loading Miscellaneous Articles in Sacks.

Sacks are most convenient for carrying all sorts of miscellaneous articles, because, provided the loads are equally balanced, they are easily carried and require no lashing. A large sack can be readily improvised for this purpose by sewing up the mouth and cutting an opening in the middle. The ends will then form two pockets and the sack has merely to be thrown over the saddle.

Diamond Hitch.

Another method of loading pack animals, which is very largely used in America, is that called the "Diamond Hitch." With this method, either a pack-saddle, very similar to the Service Transport Saddle, is used, or else the Mexican "Aparejo."

The "Aparejo" consists of two sacks or pillows, made of leather or canvas, which are sewn together along one long edge, and stuffed full of hair or good springy grass; a large

PLATE 45.

Diamond Hitch

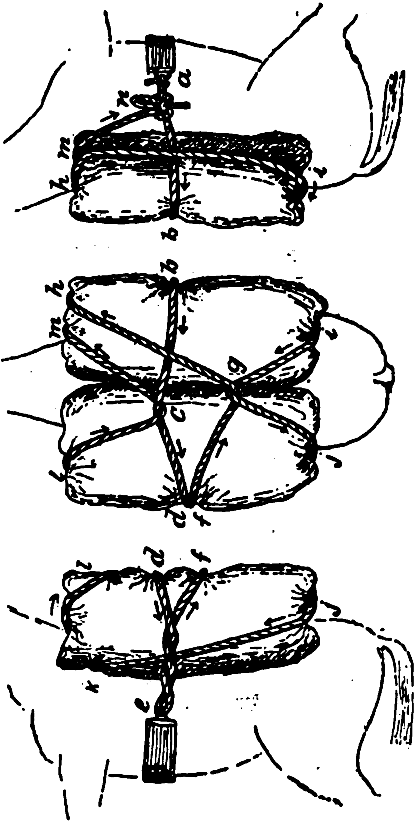

a
b
c
d
e
f
g
h
i
j
k
l
m
x

Fig. 1. Near side View

Fig. 2. Top view

Fig. 3. Off side view

opening or slit is then cut in the middle of the inner side of each sack to allow the driver to slip his hand in and alter the stuffing in any way so as to fit the animal's back.

The sacks are placed high up on the animal's back, leaving a large passage for air along the backbone, and are secured by a big surcingle binding them tightly to the animal. A breeching and sometimes a breast-piece are in addition usually used to assist in keeping the sacks in position.

Plate 45 shows the method of tying on the load. A broad surcingle is used with a hook or loop at both ends. One end of the loading rope is first made fast to the hook of the surcingle on the off side of the animal, as shown at *a*, Fig. 3; the rope is then passed over the middle of the off load, across the top of both loads, and round the middle of the near load to the near side hook of the surcingle, *e*, Fig. 1. It is then taken once or twice round itself, loosely over the near load, round the length of the off load, *h* and *i*, Figs. 2 and 3, crosses itself at *g*, Fig. 2, round the length of the near load, *j* and *l*, Figs. 2 and 1, crosses itself again at *c*, Fig. 2, round the front edge of the off load, in Figs. 2 and 3. It is then fastened off with 2 half hitches on to the hook of the surcingle on the off side at *a*, Fig. 3, at which it started. This can be clearly seen in Plate 45 by following the arrows and the letters in alphabetical order, starting from *a* in Fig. 3.

To load a quiet animal in this way, one, or preferably two, skilled men are required.

Camels.

Camels are excellent transport animals in certain countries, provided their peculiarities are taken into consideration. They are most patient, and endure thirst, hunger, and pain better than other animals. When suffering from overwork, they do not, as a rule, recover with rest like a horse or mule, but pine away and die. Very often the first and only sign a camel gives that its strength is overtaxed is that it drops down dead. Their weak point is that they are very susceptible to change of climate and surroundings, and are nearly useless on slippery ground. A desert camel cannot be worked in the hills, nor a hill camel in the plains. They are good in fording rivers which are deep but not rapid. They are unintelligent and cannot be taught much, but, if properly selected and cared for, they are excellent transport animals, and are not more difficult to deal with than others. They require a long time, 6 hours daily, to feed, during which they should be allowed to graze, but they will not graze at night. Owing to their height they suffer severely from badly balanced loads, consequently great care should be taken in loading.

Load.

A camel's load is 250 to 450 lbs., according to size and breed; exclusive of saddlery. Taking this as the load, the following are some of the articles with which it can be loaded :—

5 S.A.A. boxes	400 lbs.
5–6 Provision cases . . .	300–360 lbs.
4–5 Bales of compressed forage .	320–400 lbs.
4–5 Tents	320–400 lbs.
66–88 Blankets or waterproof sheets	300–400 lbs.
45–56 Great coats . . .	300–400 lbs.
35–47 Camp kettles . . .	300–400 lbs.

Marching.

Twenty miles a day is the maximum to be expected from camels without breaking down. If the march is not more than 15 miles, it can be done at once without a halt for grazing ; but if of 20 miles, it is better to do 15 miles in the morning and 5 in the evening. The best time to start is at 2 or 3 a.m., march till 9 a.m., then halt and complete the march after 4 p.m., thus marching during the coolest parts of the day and grazing during the hottest.

Pace.

The usual pace of a camel is 1½–2½ miles per hour. This pace can be kept up even for the longest marches.

Food and Water.

In feeding camels the two general rules to be borne in mind are:—

Firstly. They must have a sufficient supply of fodder, or as much grazing as possible.

Secondly. A sufficient time of quiet must be given daily to allow them to chew the cud.

The ration in India, if there is no time for grazing, is 6 lbs. grain with 40 lbs. of green or 25 lbs. dry fodder, or 16 lbs. of bhoosa and 1½ ozs. of salt. Grain should always be crushed or soaked in water.

A camel drinks about 15 gallons of water daily.

It is sufficient to water a camel once a day in cold weather and twice in hot weather.

An Egyptian camel should be watered daily.

An Indian camel does well if watered every other day.

A Somali camel can go for 4 days without water, but it is better to water daily if possible.

Camels can be trained to do without water for a few days by watering them less frequently for some days in advance.

Camels prefer still to running water, and should be watered when the sun is up and the water warm, usually on the way back from grazing and before they get the grain ration. They should not be allowed to drink during the march, unless it is known that no water will be procurable at the next halting place.

If camels are exhausted after a march, they should not be fed immediately on arrival in camp, because their digestive organs are not then in a proper condition to assimilate their grain. They should first be watered and groomed and then fed.

FITTING OF SADDLERY.

Form of Pack Saddle.

The pack saddle is a simple affair, consisting principally of two strong wooden arches joined together on either side by a connecting pole or poles, often consisting of 2 or 3 bamboos; these arches support a stuffed pad on both sides.

The fitting of the saddle is most important, and is a matter of perfect and accurate stuffing of the pads. The pads after a time take the shape of the animal's back, and for this reason each camel should retain its own special saddle.

When placed on the back, the pads should be well clear of the hump, which should in no way be pinched by them. The rear of the pads should not touch the hip bones, which, having a certain motion when the animal is moving, are thus liable to be galled; nor should the pads extend over the short ribs. The stuffing should be full and firm, so that the weight of the load may be equally distributed.

Girths.

When the saddle is first put on, the girths must be tied tightly or they will become loose after the saddle works into its place; but when the load is on, they need be only tight enough to prevent the saddle from moving. The hump and the balance of the load, if properly adjusted, practically keep the saddle in its place.

Head Collar and Rope.

The head collar is fitted as in the case of a horse or mule, and the leading rope is tied on to it.

Care of Saddlery.

See p. 563.

METHOD OF LOADING.

The method of fastening loads on camel pack-saddles will be best understood by reference to Plate 46. It will be seen

PLATE 46.

Method of loading Camels

Fig. 1.

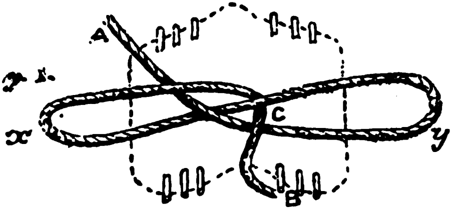


Fig. 2.

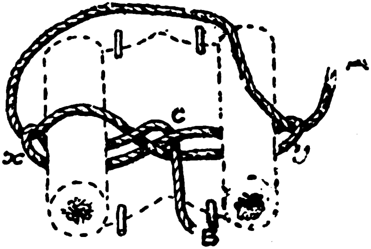
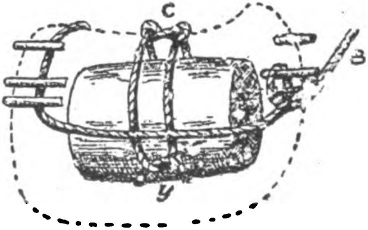


Fig. 3.



from this that two loops (x, y) are formed, one on each side of the saddle (Fig. 1). The loads are then placed over the loops; one end (A) of the rope is passed over one load, through one loop (x) over the saddle, and then through the loop y over the load on the other side—(*vide* Fig. 2); the other end (B) of the rope being then taken horizontally under the connecting poles of the rear end of the saddle, across the load, round the connecting poles, and finally fastened to A on the top of the saddle at C as shown in Fig. 3.

In loading camels it is essential that the loads should be equally balanced and as compact and evenly distributed as possible. The load should rest principally on the upper part of the ribs, but nothing should touch the hump. The lower line of the load should be as nearly as possible on a level with the camel's shoulder. The greater part of the weight will then come on the camel's fore legs, and not on the hind-quarters. Loads should be long and shallow rather than short and deep.

Method of preventing Camel rising when being loaded.

A camel will often try to get up when its load is half secured, resulting in loss of time and temper. For this reason, before commencing to tie on a load, the camel should be secured by passing its head-rope round the off fore-knee, securing the rope by a half hitch, then passing the rope over its neck and round the near fore-knee, and finishing off with a clove hitch.

Number of Men required for saddling and loading.

Three men are required to saddle a camel; one on each side, and the third standing in front holding the nose-rope. Five men are usually required for loading a camel; two on each side, and the fifth holding the nose-rope.

Tying Camels on the March.

When on the march, camels are, as a rule, tied together in strings of not more than three in single file. The head of the second and third camel should be tied to the tail of the one in front of it by a head-rope, and not by the nose-rope.

Each camel driver must himself lead his three camels, and not fasten them to the camels in front.

Unsaddling.

When camels arrive in camp, their saddles should be left on for one hour at least, to allow their backs to cool gradually. After the saddles have been removed, the animals should be carefully inspected and any sores treated at once. A good hand rubbing is necessary to prevent sores. This is the only grooming practical on service.

If the saddles have been left on the camels at night to keep the animals warm, they should be taken off and the backs examined for galls and sores before being loaded next morning.

Camel Lines in Camp.

If space is available, it is better to make camels sit down in circles in camp, all stones having first been cleared away.

The camping ground should be kept as clean as possible, and the camels groomed whenever practicable, as they suffer very much from ticks and lice.

Routine in Standing Camp.

The usual routine in a standing camp would be somewhat as follows: Half the ration of grain would be given first thing in the morning and the other half towards evening; grooming twice a day, once just after the morning feed of grain, and again just before the evening feed; grazing for six hours in the middle of the day, and watering after grazing. The allowance of hay, or its substitute, should be placed in front of each camel after its evening half-ration of grain has been eaten.

Donkeys.

Donkeys are sometimes used as pack transport, more especially on lines of communication in India.

They are very hardy little animals, and require little in the way of rations, because they feed on what they pick up as they go along. They are small as a rule and very often deformed, through having been worked when far too young. They carry a small load of 100 lbs. or less. The saddle, called "sunka," consists of a bolster, stuffed with straw and thin bamboo canes. It is doubled in the centre and tied closely round the animal with a rope. The bend of the bolster is placed well forward in front of the withers, a layer of blankets being usually placed above and beneath the "sunka" as a further protection to the withers. The load, which is often placed in a divided sack, as mentioned under the head of "Mules" on p. 552, is then placed over the "sunka."

Donkeys wander along with their loads at about 2 miles per hour, covering about 15 miles a day, and only one man is needed to herd a large number.

The forage allowance for a donkey is 4 lbs. of grain, 25 lbs. of green, or 13 lbs. of dry fodder, or 13 lbs. of bhoosa.

Bullocks.

The bullock is a good animal for slow draught and pack work, especially over bad country. When in fair condition, and with an average load, a bullock can do from 15 to 18 miles a day, according to the nature of the country.

During hot weather, bullocks always work better in the early morning and late afternoon, except in India where, being used to the heat, they can be worked all day.

Load.

A pair of bullocks will draw a load of about 800 lbs., while a pack bullock carries about 160 to 200 lbs.

Pace.

A bullock's pace, either as a draught or pack animal, is about 2 to 2½ miles per hour, but he must not be hurried. A bullock can work on an average from 7 to 8 hours per day.

Food and Water.

A bullock requires little care, and thrives well on poor food. In India, the rations for working bullocks are :—

	Draught.	Pack.	Siege Train.
	lbs.	lbs.	lbs.
Grain	6	4	7
Fodder, green	30	30	35
,, dry	20	14	25
Bhoosa	14	14	20
Salt	⅔oz.	⅔oz.	⅔oz.

Bullocks should be allowed to graze for 6 hours a day, and if practicable, for longer. It is a good plan to graze for an hour in the morning before starting on a march, so that they can chew the cud *en route*, and should be watered daily at least three times in summer and twice in winter. A bullock requires about 5 gallons of water a day, and should be fed, generally speaking, at the same time as a horse or pony (see "Horse Management," p. 395).

Pack Equipment.

The pack equipment consists of pad, suleethas, and loading ropes, weighing altogether 50–60 lbs.

Head Rope.

If any head rope is used, it is merely tied round the horns and allowed to hang loose, but usually it is not required.

Method of Loading.

The sack mentioned under "Mules," p. 552, is generally used for carrying loads.

Routine on the March.

When bullocks are used as draught animals it is usually essential to employ native drivers, who are accustomed to the method of driving them. When used as pack animals they should be driven in a herd with, say, one man to every 10–15 bullocks.

Bullocks should be given a short rest about every 6–7 miles, and during the midday halt should be allowed to graze and water freely. If they are to be marched throughout the day in cold weather, they should be allowed to graze freely in the morning and on arrival in camp.

If bullocks are worked much on hard roads, they should be shod.

For method of shoeing, see p. 447.

Routine in Camp.

In camp, bullocks are tied on lines in the same manner as horses, but without heel ropes.

Care of Saddlery and Harness.

All leatherwork should be kept soft and pliant, and should not crack if bent round the finger. On return to camp or stables all ironwork likely to rust should be rubbed over with an oiled rag. Saddles should not be piled on the top of one another, and, so that the arches should not be bent, no weight should be placed on a saddle when on the ground. Leather which is damp from sweat should be sponged with clean cold water, then hung up to dry and later rubbed well on the inside with soft soap. The outside of leather work may be wiped if dry; sponged if wet and muddy, and, when slightly damp, a little soap applied. Soap should be used daily on all articles in constant use. Leather must not be washed with soda or soaked in water and is ruined by hot water. Leather must not be dried by a fire.

Head Ropes.

After being sponged head ropes should be washed with weak pipe-clay water.

Traces.

To clean traces, the rope should be scrubbed, and the piping sponged, hung up to dry, and then well rubbed with soft soap.

Numnahs.

Felt numnahs should be brushed after use and placed so that the sun can dry them, then beaten and brushed again so that they are cleansed from all dirt and grit, because if this is not done sore backs are likely to occur.

Leather numnahs should be rubbed with soft soap on the inside only, and should never be placed in the sun.

Saddle Linings.

The linings of saddles and pads should first be dried and then well beaten.

Web Girths.

Web girths should be scrubbed with clean cold water and hung out to dry. If the sweat is not scrubbed out of them, they will become hard.

Soft Soap.

In using soft soap it should be worked up into a lather and then put on with a sponge, but it should be used very sparingly, because it contains an excess of alkali.

Dubbing.

Dubbing is one of the best preparations to preserve and soften leatherwork. It is made as follows: Equal parts of purified mutton fat and sweet oil are melted together and then left to cool, a little turpentine or camphor being then or afterwards added. The best way of purifying mutton fat is to cut it into lumps about the size of a chestnut, then melt it and skim off impurities.

(3) Carrier Transport.

Occasions for use.

Transport by carriers has to be resorted to when no better form is available; such as in Tropical Africa, where the tetse-fly or other cause prohibits the use of animals, and in

China, and among some of the mountain ranges of India and Assam, where a lack of animals, or of tracks suitable for animals occur.

The disadvantages of carriers are that they carry a small weight, and that, therefore, large numbers have to be employed occupying considerable road space in proportion to load carried; and also that they are expensive.

They can, however, be told what to do, and when not carrying loads can be used for other purposes.

Carriers can usually be most advantageously employed when a staging system is arranged, as they can then live in their own villages, and make their own arrangements for food, but this usually leads—in East and West Africa at all events—to a large proportion of absentees.

ORGANISATION AND EQUIPMENT.

Each carrier should have fastened round his neck a metal disc with his number on it; he should also have a machette or long knife to cut firewood, etc. The carriers are best formed into sections of 20 or 25 men, under a headman and an assistant.

Four or five sections form a company, under a higher grade of headman, such as an interpreter or N.C.O.

One British officer and a doctor can usually manage a corps of from two to five companies; the number depends on (1) the standard of the company and section headmen, and (2) the extent to which the corps will be broken up.

The headman of a section tells his section off to their loads, receives and distributes their rations, and is responsible for seeing that his section is present, and for reporting absentees, seeing men go on to the sick list when ill, and that orders as to sanitation are obeyed. He leads his section on the march.

The assistant helps the headman in the above, assists the men in picking up their loads, and, if a carrier falls out on the march, stays with him and sees that he rejoins his section with his load, or, if unable to proceed, that the load is handed over to the headman of the spare carriers; he assists in stacking the loads in camp. He follows in rear of the section on the march.

The N.C.O. in charge of a company draws the rations for his company, and distributes them to section headmen. He is responsible that his company is present, and that absentees are reported.

The British officer deals with all matters of discipline, and should have a free hand regarding punishments.

The use of simple colours for the tapes, to which the number discs are attached, facilitates the marshalling of carriers in camp, and on the march; a colour may be allotted to a company, or to a particular nature of load, *e.g.* ammunition, hospital stores, rations of different kinds.

MARCHES.

Length of March.

From 15–25 miles a day; depending on (1) the load, (2) pace, (3) nature of road, (4) climate.

Pace.

The pace is the same as troops on foot, though some tribes go at jog trot, and can do over 4 miles per hour; the pace depends of course on the weight of the load and the condition of the track.

Load.

The load of a carrier is from 40–60 lbs., exclusive of his own clothing, depending on (1) strength of carriers, (2) pace required and length of march.

Loads are generally carried on the head; but by some tribes living in mountains loads are carried on the back with straps over the shoulders or across the forehead. Many loads are best fastened to a pole and carried by two men; loads too heavy for two men must be fastened to a form of stretcher, and carried by four men. In these cases the carriers use their heads or shoulders to take the weight.

A long load is easier to carry than a compact one.

If frequent halts are anticipated, much exertion is saved by fastening the load in a simple frame made of two sticks, about 5 feet long; the load at one end; and the other ends fastened together. At a halt the ends can be put on the ground, thus keeping the load vertical about the height of a man's head.

Routine on the March.

If an action is expected, it is usually advisable to form two columns, one for fighting, and the other of the baggage and its escort.

It must be remembered that as carriers are unarmed and quarter is not given by savages, they are very susceptible to panic. Arrangements must therefore be made to prevent them throwing down their loads and bolting.

Sections usually march in single file.

The minimum road space required when a column is moving at 3 miles per hour in single rank is 4 feet; 5 feet is the normal distance per carrier.

If a march is started before dawn, it is advisable to start the carriers at least 6 feet apart to prevent checks. If attacked the carriers should be herded up close, with the escort round them.

Routine in Camp.

(*a*) *Standing Camps and Posts on Lines of Communication.*

Loads should be brought in and placed under a guard of the post, a separate camping ground being allotted to carriers. Simple rules for sanitation should be enforced through the headman; with Africans a liberal use of the lash in the first instances of non-compliance is advisable. The lash is a better punishment than deduction of pay, which they are apt to regard as unfair; overloading should never be resorted to as a punishment.

(*b*) *Camp on the Line of March.*

The placing of the loads in rows facilitates starting the next morning, and saves exertions in stacking.

The loads should be placed inside the square under a guard; the carriers sleeping and cooking outside the square; in case of alarm they can huddle up inside the square, thus reducing the perimeter of the camp. If the tactical situation does not admit of their sleeping outside, the loads must be stacked and ground space allowed on which the carriers can sleep. They must not be allowed to sleep among the loads, or those containing rations will be broached.

Loads may, of course, be used to form a rampart.

(4) Mechanical Transport.

A light traction engine with truck and G.S. wagon occupies a road space of about 17 yards, and will carry a load of from 4 to 5 tons for 30 miles a day at a rate of 5 miles an hour. It is necessary to refill its water tanks every 15 to 20 miles.

Engine drivers should not be required to work on the foot-plate for more than eight hours per diem, and engines should be given a day's rest, if possible, once a week for cleaning out, overhaulage, etc.

When employed in convoys, a distance of about 25 yards should be maintained between large traction engines and trains, and 10 yards between small trains. In going up or down steep hills this distance should be increased to 40 yards.

Steam engines should not be halted on steep gradients when it can be avoided.

Motor lorries are now in general use.

INDIAN ROAD TRANSPORT.

Transport Loads.

The authorised transport loads are (a "maund" is 80 lbs. avoirdupois) :—

Description.	Loads. Maunds.	Remarks.
G.S. wagon (4 horse)	30 to 40	
A.T. cart, with 2 mules, 2 ponies, or 2 bullocks	10	
Bullock cart	12	(only 10 in hills)
Pack camel	5	
Pack mule, pony, donkey, bullock, or yak	2	
Ekka, 1 pony	6	
Jap 2-wheel transport cart with 1 pony	4	
Jap hand cart with 3 coolies . . .	3	
Indian coolie	½	

Rates of Marching on a Level Road.

Description.	Miles per hour.	Remarks.
A.T. cart, with mules or ponies . .	2½	
A.T. bullock-cart	1½	
Camels	2	
Pack mules or ponies	3	These rates include short halts only.
Pack bullocks	2	
Pack donkeys	1½	
Coolies	2	
Tractors	3½	
Motor lorries	10	

Time taken to pass a given point.

The following in single file will, on a level road, pass a given point in 10 minutes :—

250 pack mules, or 120 pack camels, or 100 mule or pony A.T. carts, or 60 bullock A.T. carts.

In rough, uneven country halve these numbers, and, on mountain tracks passable only by pack animals, the big numbers opposite the first two may be divided by 4.

Road Spaces.

Length of road taken up by Transport in single file :—

100 camels	500 yards.
100 pack mules or ponies	350 ,,
25 carts (with 2 animals)	175 ,,

The above assumes animals to be well closed up.

Road space and pace of Transport on a L. of C. in Hills.

Mules and Ponies.—Pace, 2½ miles per hour.

1000 mules in single file take up 3 to 4 miles of road.

Time taken for a 10-mile march from start of 1st animal to arrival of last, 5 to 6 hours.

Camels—Pace, 1½ miles per hour.

1000 camels in single file take up 4 to 5 miles of road.

Time taken for a 10-mile march as above, 9 to 10 hours.

On unmade or badly aligned roads the time taken will be much longer.

TABLE OF MAXIMUM GRADIENTS.

The maximum gradients that are generally admissible are:—

1 in 25 for wheeled traffic, with continuous ascents exceeding 5 miles in length.
1 in 20 for wheeled traffic in general.
1 in 17 is practicable for a cart road.
1 in 16 for laden camel and mule carts.
1 in 10 to 1 in 8 for pack animals.
1 in 5 for foot traffic.
1 in 4 for a mule path is practicable but most wearing and fatiguing.

For short distances :—

Infantry can use roads as steep as 1 in 2 or 3.
Artillery can use roads as steep as 1 in 7.
Traction engines draw their own weight up 1 in 10.
Traction engines draw twice their own weight up 1 in 20.

Traction engines draw three times their own weight on the level and up slopes not exceeding 1 in 35.

Motor vehicles from 1 in 10 to 1 in 8.

INLAND WATER TRANSPORT.

CANAL TRAFFIC. UNITED KINGDOM.

Horse-drawn boats.

Weight of load which can be drawn by 1 horse	50 tons in 1 boat; 60 tons if in 2 narrow boats.
Average number of miles per day which 1 horse can do . . .	25 miles.
Average pace per hour with one horse	2 miles per hour with 50–60 tons; 3 miles per hour with 25 tons.
Average time taken in passing a lock	6 minutes 40 seconds.
Average number of hands . .	3 (man, wife, and boy).

Tug-drawn boats and barges.

Boats in general use . . .	30–50 tons.
Barges in general use . . .	80–100 tons.
Average pace per hour of tugs when towing boats or barges on canals .	3–4 miles per hour.

CANAL AND RIVER TRAFFIC IN WESTERN EUROPE.

The waterway system of Holland is very extensive. On the large waterways (grande section) one tug draws as many as five barges of 500 tons each at an average speed of five miles per hour, while with a single barge carrying 2000 tons a speed of eight miles an hour is attained. The average time in passing through a lock is 25–30 minutes. Horse-drawn barges are only used on the small waterways.

The waterway system in France and Belgium is also very much more extensive than in England, as will be seen from the examples given below. "First-class waterways" comprise all waterways which have a depth of at least 6′ 7″ (suitable for barges with draught of 5′ 11″), and of which locks are at least 125′ in length and 17′ in width. All others are called "second class." In Belgium tugs are largely used on the first-class waterways, *e.g.* Meuse, Escaut, Sambre, Ruppel. In the examples which are taken of French waterways, the method of traction is indicated in each case, T = Tugs; H = Horses; chains are employed in a few places, while sails are often used. Where two methods are in use both are indicated. The capacity of barges on first-class waterways may be taken as 280 tons or somewhat more, though in some cases, *e.g.* on the Seine, it is considerably larger. The clearance under bridges in France ranges from about 10′ to 12′ 9″; but the average on first-class waterways may be taken as 11′ 6″. Between Bergues-Furnes (see IX. below) it is only 8′ 10″.

The figures *not* in parentheses between the names of two places indicate the number of miles which separate them, while the figures in parentheses indicate the number of locks between these places. The latter are as a general rule only given in the case of France.

I. Antwerp 53 Bocholt 79 Bois-le-Duc (Holland).
II. Antwerp 53 Bocholt 35 Maestricht 30 Liége 40 Namur.
III. Antwerp 44 Beverloo; Antwerp 53 Hasselt.
IV. Antwerp 10 Rupelmonde 25 Louvain.
V. Terneuzen (Holland) 44 Ghent.
VI. Ostend 44 Ghent 31 Termonde (by R. Bas Escaut) 19 Rupelmonde 10 Antwerp.
VII. Nieuport 46 Ghent.
VIII. H. Gravelines 4 (0) Le Guindal 13 (3) Dunkirk 13 (3) Furnes 8 Nieuport (see VII.). Note.—Dunkirk to Furnes second class waterway; barges, capacity, 200 tons; draught, 5′.
IX. H. Calais 18 (3) Le West 3 (0) Watten 15 (3) Bergues 14 (1) Furnes (see VIII.). Bergues-Furnes, second class, see Note VIII.
X. H. Calais 39 (5) Aire 54 (7) Courtrai 44 Ghent.

XI. H. but electric between Béthune and Bauvin; Calais 28 (3) St. Omer 25 (3) Béthune 11 (1) Bauvin 12 (1) Lille 15 (14) Roubaix 8 Espierres 25 Audenarde 20 Ghent.

XII. T. H. (but St. Valery to St. Simon H.) St. Valery 39 (9) Amiens 57 (16) St. Simon 49 (29) Etrun 23 (9) Condé 9 (2) Mortagne 19 Espierres (see XI.)

XIII. T. H. (see XII. note) St. Valery 96 (25) St. Simon 72 (38) Condé 5 (7) Pommerœul 18 Ath 39 Termonde; Pommerœul 11 Mons.

XIV. H. (at all events to Belgian frontier) St. Valery 96 (25) St. Simon 10 (5) Fargnies 101 (63) Charleroi 44 (55) Brussels 31 (5) T. Antwerp; Charleroi 31 Namur 40 Liége.

XV. T. H. Havre 75 (0) Rouen 150 (8) Paris.

XVI. T. H. Havre 181 (7) Conflans 61 (7) Compiègne 57 (13) Berry-au-Bac 65 (46) Pont-à-Bar 60 (20) Givet 35 Namur.

XVII. H. (but Havre to Paris T. H.) Havre 225 (8) Paris 125 (23) Conde-sur-Marne 10 (3) Chalons-sur-Marne 20 (7) Vitry 29 (33) Bar-le-Duc 52 (63) Toul 20 (5) Nancy 27 (12) Xures (German Frontier) 65 Strasbourg.

XVIII. T. H. Toul (see XVII.) 55 (25) Verdun 62 (18) Sedan 7 (3) Pont-à-Bar (see XVI.).

The above are only some of the principal waterways, but sufficient have been quoted to show the comprehensiveness of their system.

In Germany the average barge loads during the normal condition of the rivers are as follows:—

Elbe: Prague to Aussig, 200 tons; Aussig to Hamburg, 600–700 tons, some carry up to 1200 tons; Oder and Weser, 400–600 tons.

Rhine: 529 tons, some carry up to 2600, and a few up to 3500 tons.

PART XII.

ENCAMPMENTS AND SANITATION.

ENCAMPMENTS.

Three Kinds of Encampments.

There are three kinds of encampments, namely :—

1. Camps—where the troops are sheltered by tents ;
2. Bivouacs—where the troops sleep in the open, sheltered possibly under blankets, tentes d'abri, or similar kinds of shelter ;
3. Billets—where troops are lodged in houses or buildings.

Relative Advantages of Each.

1. Camp. Advantages : Troops are more concentrated and ready for immediate action than in the case of billets. If the weather is bad, camps are less trying to the health of troops than bivouacs, but will only be used on service under exceptional circumstances. In a siege or blockade, tents may be replaced by huts. Disadvantages : Troops in tents require more transport than troops in billets or bivouacs.
2. Bivouacs. Advantages : Reduction of transport. Give the greatest facilities for the concentration of troops in readiness for action. Disadvantages : If the weather is bad, bivouacs are very trying to the health of troops.
3. Billets. Advantages : Maximum amount of comfort to troops both as regards sleeping and cooking, their powers of endurance being consequently

increased. Disadvantages: Difficulty of concentrating a large force. This may be obviated, however, by adopting a system of close billets, in which case as many of the men as possible sleep in houses while the remainder bivouac.

Billets are greatly in favour with the German Army Authorities, who consider that troops should seldom camp or bivouac if billets can possibly be obtained.

In the presence, however, of an enemy, tactical considerations, *e.g.* favourable ground for defence in the event of attack, concealment, facilities for protection, and economy in numbers required for outpost duty are of the first importance.

But, on the line of march, the utmost possible use is to be made of buildings lying on or near the roads by which the force is marching. It is only in exceptional circumstances that tents will be used by troops engaged in field operations.

CAMPS AND BIVOUACS.

General Considerations when choosing Ground for Camps or Bivouacs.

When choosing ground for a camp or bivouac the following are the main points which should be taken into consideration:—

1. Facilities for defence;
2. Economy of outposts;
3. Good communication between site of camp and line of defence;
4. Screening from observation;
5. Suitable site;
6. Good means of approach from line of march;
7. Good and abundant water supply;
8. Facilities for obtaining food, fodder, and fuel.

Considering these in their order:—

1. *Facilities for Defence.*

Facility of defence is one of the most, if not the most, important factors when choosing ground for camp.

Generally speaking, what is required is a good line of defence, such as a ridge, with a clear field of fire beyond it. If the flanks are protected by some natural obstacles, such as an unfordable river, so much the better.

When operating against a savage enemy there should be facilities for surrounding the camp with some kind of defence works, such as trenches, stone walls, or some form of zareba.

For construction of obstacles, see p. 727.

2. *Economy of Outposts.*

Outpost duties being very exhausting to troops, economy of outposts is an important matter. Ground which affords several avenues of approach to the camp or bivouac must obviously require a larger force on outpost duty than ground which offers only few avenues of approach.

3. *Good Communication between Site of Camp and Line of Defence.*

If the force is attacked while at rest, the defensive line must at once be occupied, and it is therefore important that there should be ready means of communication between the camp and the line of defence.

4. *Screened from Observation.*

If possible, the site of a camp should be screened from observation, or else the enemy may take the opportunity of reconnoitring the force and ascertaining its strength. If, however, what is otherwise a good camping ground is overlooked from some hill in the vicinity, this risk may be guarded against to a considerable extent by posting on the hill one or more detached posts.

5. *Suitability of Site.*

The best site for a camp is on a gentle grass slope, with a dry sub-soil, such as gravel, the slight slope facilitating drainage. The ground which most nearly complies with these conditions should therefore be chosen.

The following should always be avoided :—

1. Steep slopes ;
2. Large woods with undergrowth ;
3. Low meadows ;
4. The bottoms of narrow valleys ;
5. Newly turned soil ;
6. Clay ;
7. Ravines and water courses ;
8. Virgin forest in tropical countries.

Sites of old camping grounds should, if possible, be avoided.

6. *Good Means of Approach from Line of March.*

That a camping ground should have good means of approach from the line of march is an obvious requirement, particularly in the case of a large force. If the means of approach are indifferent but capable of improvement—for instance, by cutting down hedges and filling up ditches—this should be particularly noted during a reconnaissance. Engineers could then be sent forward to make the necessary clearings, etc.

As to Clearings, see Part XIV. pp. 725 and 730.

7. *Good and Abundant Water Supply.*

A good water supply, as abundant as can be got in the vicinity, is practically a necessity, especially for a large camp.

It should be noted that :

A man requires 1 gallon a day for drinking purposes, and if available, 2 to 3 gallons for washing.

A horse requires 6 to 8 gallons per day.

An ox 6 to 8 gallons daily.

As to method of calculating the amount of water in a stream, and as to reporting on the water supply see pp. 104, 105.

Reconnaissance of Camping Grounds.

For the points on which to report when making a reconnaissance of camping grounds, see p. 123.

Distribution of Troops in Camps and Bivouacs.

The following rules must be observed in distributing troops in areas, whether billets, camps, or bivouacs are used :—

1. When liable to attack, infantry should be in the more exposed positions, cavalry and other mounted troops in the less exposed. Artillery transport and supply and ammunition columns and medical units should always be covered by the other arms ;
2. Depôts should be near good roads ;
3. Dismounted units should be nearest the water supply ;
4. Staffs and hospitals should have the first claim on buildings;
5. When shelter is limited, cavalry and then other mounted troops have precedence of dismounted troops.
6. Hospitals should be given a quiet spot and the most sanitary position ;
7. Staff offices should if possible be situated close to telegraph offices ;
8. Officers should be billeted, camped, or bivouacked close to their men.

Spaces required by Different Units.

According to "Field Service Pocket Book, 1914," the following are the minimum camping and also bivouac spaces required by the different units :—

Cavalry Regiment	160	yards by	150	yards.
Battery of Artillery	75	,,	150	,,
Infantry Battalion	75	,,	150	,,
Field Company R.E.	35	,,	150	,,
Field Troop R.E.	50	,,	50	,,
Signal Squadron	75	,,	175	,,
Signal Company with Division	75	,,	150	,,
Field Ambulance	120	,,	200	,,

Spaces and Intervals for Troops, Guns, and Vehicles.

In parking vehicles the following distances should be kept clear in front of guns or vehicles which should be parked with the units to which they belong, the following distances being kept clear in front of them.

Heavy guns (8 horses)	16 yards
6 horse gun or wagon	12 ,,
4 horse vehicle	8 ,,
1 or 2 horse vehicles	5 ,,

Mechanical transport vehicles will require special arrangements.

A minimum interval of 1 yard should be left between guns or transport vehicles.

If space admits guns should be parked at half interval (9½ yards).

In the case of mounted troops and infantry, an additional space of 60 yards in depth in the front of the camp or bivouac must be allowed for the purpose of an alarm post.

It is laid down that the usual interval between units is 10 yards. Between squadrons of the same regiment; and between the component fractions of an artillery brigade, the interval may be reduced to 1 yard, and between the companies of a battalion to 3 yards.

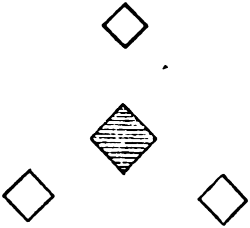
Formation of Camps and Bivouacs.

General Formation of Camp.

It is very often advantageous for units to camp near each other, but not in the same camp, in such positions as mutually to support each other in case of attack on one.

Troops camped in such a way cannot be surprised by a night attack as they can if all camped together.

The usual system is to place the different camps in triangle or diamond position with regard to one another, within rifle shot of each other, and sometimes with their transport, or water or native followers in a central position protected by them, thus :—



Formation of Camps and Bivouacs for Units.

A staff officer will be sent forward to select a camping place, and when brigades come within 2 or 3 miles of the camping ground, a staff officer from each brigade, accompanied by a representative from each unit, will ride forward and receive directions as to arrangement for the camp. They will then, on the arrival of the column, guide their units to their allotted ground, and explain the arrangements to the commanding officers. The commander of each unit will then commence to form his camp and utilise the ground to the best advantage. The most important considerations are that :

1. The alarm post should be on the side most exposed to attack ;
2. The entrance to tents or bivouacs should face to leeward.

The second line transport of each unit should be met on its arrival by a man detailed for the purpose, and guided to its destination.

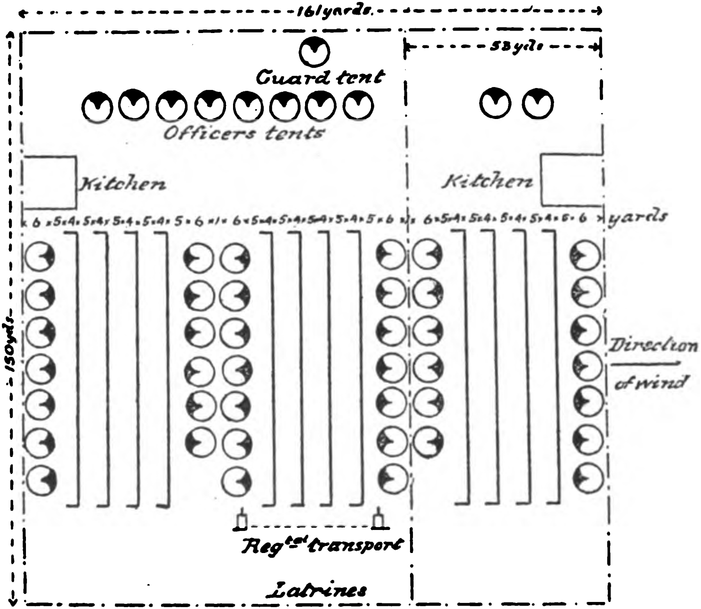
Camps for Mounted Troops.

Plate 47 shows the general formation of a Camp for Mounted Troops.

Plate 50, a Camp for a Light Horse Regiment.

PLATE 47.

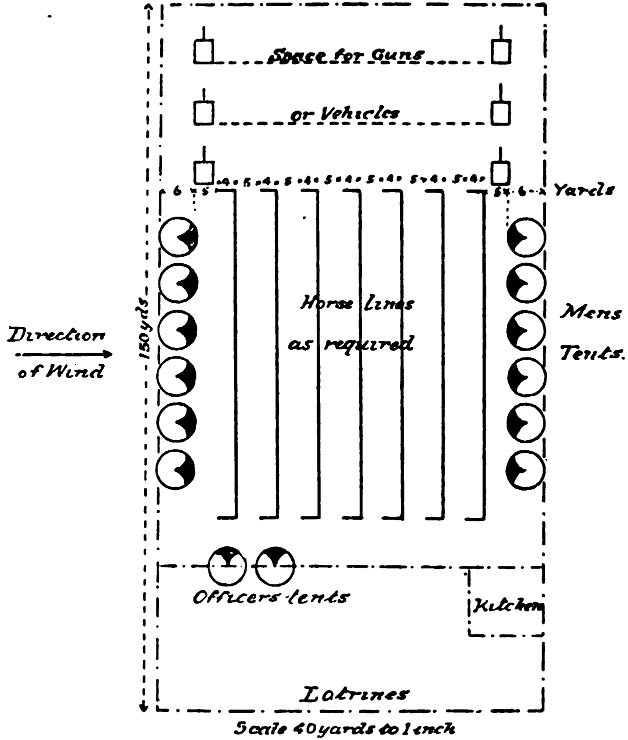
Camp for Mounted Troops.


161 yards.
53 yds.
Guard tent
Officers tents
Kitchen
Kitchen
6 5 4 5 4 5 4 5 4 5 6 1 6 5 4 5 4 5 4 5 4 5 6 1 6 5 4 5 4 5 4 5 4 6 6 yards
150 yds.
Direction of wind
Regtal transport
Latrines

Scale 50 yards to 1 inch.

PLATE 48.

Camp for Battery R.A. etc


Space for Guns
or Vehicles
6 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 6 Yards
Horse Lines
as required
Mens
Tents.
Direction
of Wind
150 yds
Officers tents
Kitchen
Latrines
Scale 40 yards to 1 inch

Artillery or R.E. Camp.

Plate 48 shows the general formation of a camp for a Battery of Artillery, Field Company, R.E., Field Troop, R.E., or a Field Ambulance.

Infantry Camp.

Plate 49 shows the general formation of an Infantry Camp.

General Directions in Camps and Bivouacs.

Directions to be given to Commanders.

The commander of each unit must be informed of the roads which he is at liberty to use, and what special defensive, police, and sanitary measures are to be taken. The place and method of destroying dead animals must also be specified. The commander must likewise be informed of any places outside his own area on which he may draw for water or obtain supplies of fuel, forage, etc. If the horses or transport animals are to be grazed, he will be allotted a grazing ground, and provisions will be made for their protection by the authority who allots them.

Directions to be given to Troops.

The following directions must in particular be given to the troops :—

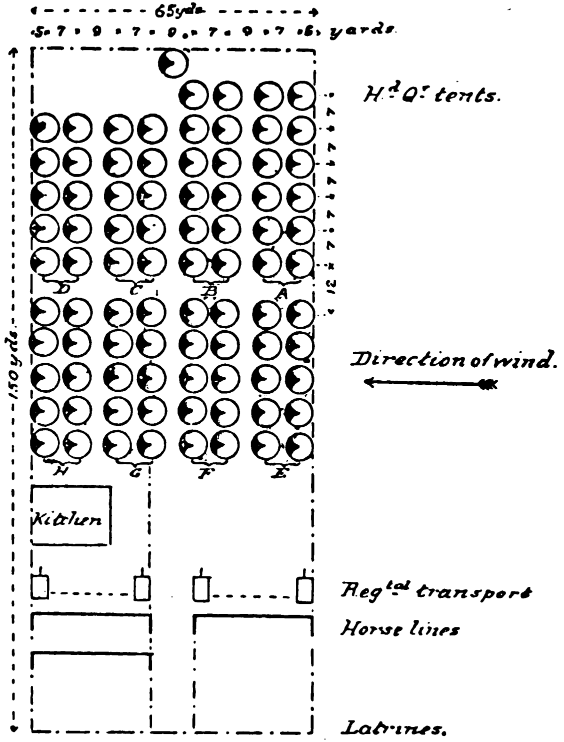
1. If " the alarm " is sounded by a trumpet, bugle, or, as would probably be the case in billets, the firing of guns, the troops should immediately fall in on the alarm posts of their units and await orders, all draught and pack animals being at once harnessed. An officer from each unit should be sent to the District or Brigade Headquarters, as the case may be, for orders.
2. All troops must know the names of the prominent features in proximity to the camp and the roads which lead to places in the vicinity.

Requirements when " constant readiness " ordered.

If the enemy is in close proximity to the camp, bivouac, or billets and an attack is expected, troops will probably be

PLATE 49.

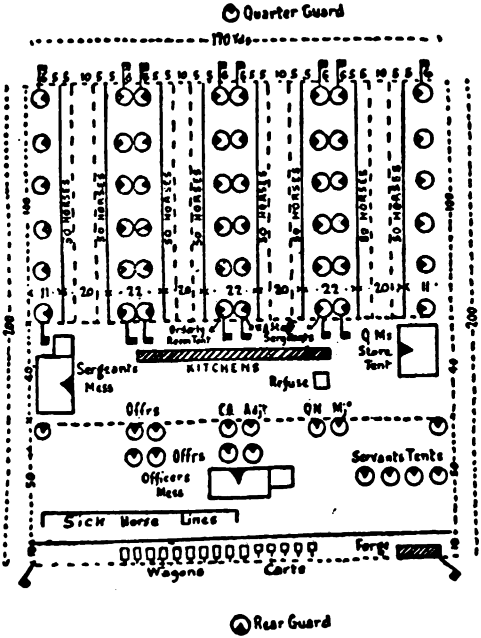
Camp for Infantry Battalion


65yds
5 7 9 7 9 7 9 7 6 yards
Hd Qr tents.
12
D
C
B
A
H
G
F
E
150 yds
Direction of wind.
Kitchen
Regtal transport
Horse lines
Latrines.

Scale 40 yards to 1 inch

PLATE 50.

Camp for Light Horse Regiment.


Quarter Guard
170 Yds
30 HORSES
200
100
50
40
11
20
22
Orderly Room Tent
Staff Sergeants
Q Ms Store Tent
Sergeants Mess
KITCHENS
Refuse
Offrs
CA
Adjt
QM
Mo
Offrs
Servants Tents
Officers Mess
Sick Horse Lines
Forge
Wagons
Carts
Rear Guard

Scale 80 Yds. to 1 Inch

ordered to remain in a constant state of readiness. When this is the case, the troops will be accoutred and sleep with their arms beside them, and if an immediate movement is likely to be required, horses should, in addition, be kept saddled and harnessed. If this is not done, their saddles and harness must be kept ready to put on at a moment's notice, and all the kit which is usually attached to the saddle must be strapped on overnight, so that it may not be overlooked in the dark.

In billets, lights must be kept burning in houses, stables, and streets, and doors must be kept open.

Cooking Places.

When each unit is told off by the Staff to a camping ground, orders will usually be given as to whether the cooking places, latrines, and refuse pits should be on the front, rear, or either flank of the unit. If no particular orders are given, the officer commanding the unit must use his discretion in the matter. As to the formation and construction of cooking places, see pp. 638, 649.

Cooking places for native troops should be some distance away from those of the British troops.

Latrines.

Latrines must be constructed at once on arrival in camp or bivouac.

As to form of latrines, see pp. 610–612.

Supply Areas for Units.

The Staff usually allot to each unit an area within which they may draw food or forage supplies or fuel.

Grazing Grounds.

Each unit will also be allotted grazing grounds for their animals. Non-commissioned officers in charge of grazing grounds must see that the animals belonging to their units do not stray beyond the limits of that unit. For the particulars as to grazing horses, see p. 395; camels, p. 556.

Special Directions relating to Camps.

Pitching Tents.

The following is the best method of pitching a bell tent, whether with two or more men :—

1. Drive 1st peg at the point where the pole is to be, which should be 7 yards from the pole of the tent on either side of it.

2. Drive in the following pegs :

    2nd peg, 5 paces to the right front of 1st peg ;
    3rd peg, 5 paces to the left front of 1st peg ;
    4th peg, 5 paces on the right rear of 1st peg ;
    5th peg, 5 paces on the left rear of 1st peg.

3. Unroll the tent and unhook the door.

4. A man should take the four guy ropes, marked red, and attach these to the four pegs already driven in.

5. Fit the pole into the tent, keeping the foot of the pole to the direct front, and drive the cap on to the pole.

6. Raise the tent and place the foot of the pole into the position of the first peg, tightening up the four guys at the same time.

7. Drive in the remainder of the pegs, commencing with those on the windward side. All pegs should be in a line with the seams of the tent ; as the ropes are put on the pegs they should be tightened.

8. A trench should be dug immediately under the curtain of the tent, and the excavated earth banked on the outer edge of the trench. The curtain should then be pegged down to the inner slope of the trench so that the canvas drains into it. A shallow surface trench should then be dug to carry away the water.

9. Dig a small hole 2 or 3 inches deep close to the foot of the pole inside the tent, and when it comes on wet, ease the strain on all the ropes by shifting the pole into this hole.

Tentage Accommodation for Officers and Men.

The following is the regulation allowance of tents for officers, warrant and N.C.O.'s and men :—

Officers commanding units	1 tent each.
Other Officers	1 tent between 3.
Warrant Officers	1 tent between 5.
Sergeants	1 tent between 7.
Corporals and men.. ..	1 tent between 15.

If the Medical Officer has a tent to himself, he has to use it for seeing patients.

Precautions to be taken in Camp.

The following regulations have now been issued :—

1. Surface drains should be constructed to prevent rain water lodging in the trenches. Half an hour's work on the first wet day, when the natural run of the water can be seen, will do more to keep the camp healthy than a day's work in dry weather.
2. Tent flies are to be looped up the first thing every morning, in wet weather on the leeward side only. In a standing camp tents will be struck periodically, and the ground underneath well swept and exposed for some hours, at least, the tents being eventually replaced on their former sites. Tents should never be pitched for occupation in the intervals.
3. Tent doors should generally face away from the prevailing wind; in mounted units they should face the horse-lines.
4. A light is never to be left burning in an unoccupied tent.
5. If rain or heavy dew is likely, tent ropes must be slackened.
6. If a camp is pitched in or near long dry grass, or heather, special precautions must be taken against fire.
7. No mounted officer or man riding or driving inside the

camp is to go out of a walk except when on duty and with special orders as to pace.

Striking Tents.

The following is the best method of striking a bell tent whether with two or more men :—

1. Take all the ropes off the pegs with the exception of the four guys. Lift the pegs and put them in the peg bag.

2. Take the guy ropes off the pegs, but keep hold of them until the pole is lowered.

3. Lower the pole with the top towards the rear and withdraw the pole from the cap of the tent.

4. Spread the tent out with the door uppermost and in the centre, and fold the sides in towards the centre until the breadth is equal to the length of the tent bag.

5. Fold the top of the tent down about half-way, and then roll the tent from the top to the bottom as tightly as possible. Place it and the peg bag in the tent bag and tie up the tent bag.

In striking tents in a hurry, as in the case of a night alarm, the first man out should take the front guys off their pegs and slacken the back guys, while the last man should seize the butt of the pole and slide it along the ground and out at the door, thus bringing the whole tent down with a run.

Special Directions relating to Bivouacs.

When no Bivouac Shelters are used.

If there are no bivouac shelters, cavalry and mounted troops should lie down in front of their horses on the lee side of their saddles, gunners under the shelter of or near their guns, and infantry in rows by companies.

It is laid down that infantry by day should pile or ground their arms on the alarm post, as well as articles of equipment, except haversack and water-bottle. At night, men must sleep with their arms and equipment beside them, except when ordered to sleep fully equipped.

Forms of Bivouac Shelters.

The following are some of the bivouac shelters which can be made :—

1. Lace two blankets together side by side, placing two sticks about 2 feet 6 inches high vertically in the ground about a blanket length apart with a string connecting them, laying the blankets over the string ; now tie one or two guy ropes to each stick, attaching the ropes to pegs in the ground to support the sticks, and pegging or fixing down the loose ends of the blankets with large stones. Each of these blanket tents will hold three men, and can be made more comfortable by putting another blanket over one end of the tent and tieing it down. This form of blanket tent will give a good deal of shelter on a wet night. A trench should be dug round the shelter in the same way as for a tent.
2. Place two sticks about 2 feet 6 inches high in the ground and about 6 feet 6 inches apart, supporting them with guys on the lee side and on the windward tying on one blanket like one side of a blanket tent.
3. Place two sticks about 2 feet 6 inches from the ground and about 7 feet apart and a cross stick between them ; branches and trees should then be cut down, the thick ends stuck in the ground and the other ends made to rest on this cross bar.
4. If the weather is not wet, nor the ground very damp, a hollow dug about 9 inches deep and 6 feet 6 inches long, wide enough for two or three men, with the sods or scooped-out earth piled on the windward side, will give some shelter.
5. A pile of stones piled in horse-shoe shape forms an excellent shelter for the head. If there are sufficient stones, they can be built on the windward side to shelter the body also.

Heath or bracken to lie on or place over one gives considerable warmth and shelter.

Billets.

Ordinary and Close Billets.

There are two kinds of billets, viz. ordinary billets and close billets.

In Ordinary Billets troops are lodged in houses or buildings at the rate of about 1 man to each 3 to 4 square yards of floor space.

In Close Billets the greatest number of troops possible are billeted in houses or buildings, the remainder being bivouacked in the vicinity. The squares, courts, and gardens of the houses will often be found convenient for this purpose. In no case should the roads or streets be used. Close Billets are only used when it is necessary to concentrate a large number of troops in a small space, but arms and units will never be mixed.

Amount of Accommodation available in Ordinary Billets.

The amount of accommodation available for men in ordinary billets is as follows :—

For rooms 15 feet broad and under, 1 man for every yard of length.

For rooms between 15 and 25 feet broad, 2 men for every yard of length.

For rooms over 25 feet broad, 3 men for every yard of length.

It may be taken that ordinary billets without subsistence can be provided at the rate of about ten men per inhabitant in each agricultural district, and at the rate of five to six men per inhabitant in town or industrial districts.

Amount of Accommodation available in Close Billets.

The amount of accommodation available in close billets may be stated to be roughly one man for every 2 square yards of floor space.

Class of Buildings best suited for Billets.

Buildings in villages or the country are on the whole preferable for billeting a mixed force and certainly for mounted troops. Buildings in towns are, as a rule, only suitable for billeting infantry. Large barns, such as are to be found at the farms in various countries, are very suitable for billeting men, particularly if there is hay or straw on which they can lie.

Accommodation for Horses.

The more horses are rested at night the more work will they be able to do next day, and, provided they get sufficient room to lie down, stables, barns, out-houses will, unless the weather is very favourable, offer them much better rest than being in the open.

The usual allowance of space for horses in buildings where there are no stables is as follows :—

In buildings of a less breadth than 24 feet, 1 row of horses.

In buildings of a greater breadth, 2 rows of horses.

Five feet of length should in either case be allowed for each horse.

Marking Houses and Stables for Billets.

When billets are being allotted to troops the following particulars should be noted on each door :—

1. Name of the unit to which the house is allotted, the recognised abbreviation being used ;
2. The number of men who are to be accommodated.

Stables should be marked in a similar manner for horses. These markings should invariably be removed on leaving.

Allotment of Billets.

In telling off troops to billets, the following points should be observed :—

1. Staff Officers should be on main communications, easily found and near their offices and telegraph office ;

2. Mounted men must be near their horses, guns, and wagons;
3. To prevent confusion in case of alarm, both sides of a street or houses adjacent to one another should be allotted to the same unit.
4. Roads and communications must never be blocked. Guns and vehicles must, if necessary, be parked outside towns and villages. If parked on the sides of roads, the first and last gun or vehicle should be marked with a light.

The following should also be observed when the troops are in close proximity to the enemy.

5. The ground floors of buildings should invariably be occupied.
6. Men should be concentrated in large buildings which are lit up at night.
7. Doors should be left open, and, if necessary, means of egress improvised. The streets should be kept well lighted. The men should lie down flat, clothed. Men of mounted corps alongside their horses, and officers with their men. If necessary, horses can remain saddled and bridled in courtyards, market places, etc.

GENERAL RULES IN BILLETS.

Officers.

The duties of officers in billets are :—

1. To endeavour to establish friendly relations between the men and the inhabitants ;
2. To visit the men and horses at irregular intervals, and see that the inhabitants are giving them the provisions to which they are entitled, and that the men's food is being properly prepared.

N.C.O.'s and Men.

A N.C.O. should be placed in charge of each house, and should, of course, endeavour to obtain from the inhabitants the best possible provision for his men.

In every house occupied by the troops, at least one man must be specially detailed to guard the arms. Arms are not to be piled or left outside. Sentries should also be ordered to watch for signals, such as firing of guns or rockets, which in scattered billets, will usually be the signal of alarm. See also p. 583.

All ranks before being told off to their billets must be warned on no account to discuss any military subject in the presence of the inhabitants, or to leave about any paper or letter. This warning should be constantly repeated, and N.C.O.'s in charge of houses must see that strict adherence is given to this most important direction.

Inhabitants.

Immediately the billeting authorities have entered the town, precautions should be taken to prevent the inhabitants communicating with the enemy. If necessary, they should be disarmed and forbidden to leave their houses after sundown. In case of any infraction on their part of any rules or regulations they should be tried by the Tribunal which will be specially constituted in each billeting area.

Water Supply.

The general rule is that dismounted units should be nearest the water supply.

On coming into camp, sentries should be at once posted over the water supply either by the police or in their absence by the first troops to arrive. These sentries must receive orders to prevent any kind of pollution, and will not be withdrawn until permanent waterguards have been detailed. The sanitary or medical officer must satisfy himself as to the fitness of water for use. It should be apportioned as follows :—

1. Drinking water for men ;
2. Drinking water for animals ;
3. Water for washing and bathing.

If flags are used, a white flag would indicate the men's drinking water, blue the animals', and red the water to be used for washing and bathing.

If there is only one stream, the upper part should be allotted for men's drinking purposes only, the middle portion for animals' drinking, and the lower portion for washing and bathing. If necessary, men must be told off to patrol the river or stream for a short way above the camp so as to prevent the water above the men's drinking place being in any way polluted. In places where the frontage to the water is small, regular hours will be allotted to units, and the route by which they should proceed to water specified.

Camp Duties.

GUARDS.

Main and other Guards.

If the men are very tired when mounting guard, the general rule of two hours on and four hours off may be varied to one on and two off. Every man must sleep with his rifle and bandolier beside him, and no clothing must be taken off.

The non-commissioned officer should see that the men have their bandoliers full and magazines charged before going on guard.

As a rule, no fire should be allowed after sundown at any outlying guard or post.

If the enemy is not reported to be in the vicinity, and there is no immediate likelihood of being attacked, the non-commissioned officer in charge of the guard may lie down after posting his sentries, and after seeing that everything is in order. But he should tell the sentry to call him in time to post each relief, and also, of course, if anything unusual occurs.

Should the enemy be reported in the vicinity, or should there be any likelihood of attack, the non-commissioned officer must continually watch the front, besides frequently visiting his line of sentries. As the early morning just before dawn is often selected for attack, the non-commissioned officer—if the vicinity is not reported to be clear of the enemy—should make the whole guard stand to their arms for one hour before daybreak, so as to be ready for immediate action.

In the French and German Armies there is a standing order that the piquets, supports, and reserves shall always get under arms one hour before daybreak.

If attacked, the non-commissioned officer must hold his post at all costs until the camp can turn out. He must remember that if he is driven in, the entire camp may be lost.

Guards on Horse Lines.

When in charge of the horse lines, the non-commissioned officer should count the horses after posting his men. He should also see that each horse is securely tied and that end pegs, if used on the lines, are firmly fixed in the ground. The non-commissioned officer must also see that each man knows the number of horses on the particular lines to which he is posted.

Every man, as he goes off, should count the horses on his lines, and every relief, as he comes on, should also count them, and see that their fastenings are secure. In doing this, they should take care not to disturb horses lying down. They should see that any horse rugs that have slipped round are pulled straight. If any man has left his horse unrugged, the fact should be reported to his troop-sergeant or corporal.

In the event of a night alarm, the two reliefs should be turned out at once to stand by and prevent the horses from lifting up the lines.

FATIGUES.

A roster should be very strictly kept by the troop-sergeant, so that each man does his turn.

When telling off the men for fatigues, it is convenient that the sections should, as far as possible, be kept together.

Any defaulters ordered to carry out the worst fatigues will do so under the charge of the provost-corporal or some other non-commissioned officer.

SANITATION IN THE FIELD.

Importance of Sanitation.

After the experience of recent campaigns, it is probably superfluous to insist on the importance of this subject, or to point out the extent to which sanitation and the prevention of disease affect the efficiency of an army on active service.

Every officer is responsible that all orders affecting the health of an army are rigidly carried out by the troops under his command. Neglect of sanitary precautions inevitably results in great loss of life and efficiency.

Every officer and non-commissioned officer should be thoroughly acquainted with all sanitary principles, and should, both in peace and war, by practice and precept teach the men under them how to carry these principles into effect. The idea that this is not possible has now been exploded. Besides this, the Japanese have shown us how untrue is the old saying, "A thirsty man cannot be prevented from drinking any water he comes across."

Prevention of Disease.

Every unit should be fully competent, within itself, to carry out all measures for the *prevention* of disease. The *cure* of disease is, of course, another story, and entirely a medical matter.

It cannot be too clearly realised that the prevention of disease is one of the most important duties of regimental officers and N.C.O.'s; and if this duty is intelligently performed the incidence of disease on active service will be lessened to an incalculable extent.

The Origin of Disease.

Enteric fever and dysentery, the diseases which chiefly affect our armies on active service, cannot arise of themselves.

They are due to certain definite and well-known factors, namely, bacteria.

These bacteria are extremely minute vegetable organisms which, on gaining access to the interior of our bodies, multiply with great rapidity, feed on our tissues, and set up the disease.

Channels by which Bacteria enter our Bodies.

The principal channels by which these bacteria enter our bodies are:—

1. Water.
2. Food.
3. Flies.
4. Dust.
5. Soil pollution.

Bearing in mind these channels of entry, the measures by which we may protect ourselves from invasion must now be considered.

1. Care and Purification of Water.

Need of Protection and Purification of Water.

Water is probably the principal medium by which bacteria enter our bodies.

An ample supply of pure drinking water is therefore essential; for this purpose men must be prevented from drinking water that is not pure, and must be trained to economise the contents of their water-bottles.

Water must, therefore, as far as possible, be protected from pollution, and, as most water on field service is impure, it must be purified before it is fit for drinking purposes.

Means of Purifying Water.

The chief means by which water may be purified are:—

(*a*) Boiling.
(*b*) Filtration.
(*c*) Treatment with chemicals.

(*a*) *Boiling of Water.*

If water be kept actually boiling for one minute or longer, all the bacteria contained in it are destroyed, and the water is then fit for drinking purposes. This measure is therefore very effective.

The chief drawbacks to purification by boiling are the difficulties of obtaining and carrying fuel, of cooling the water before it can be drunk, and the flat unpleasant taste which boiled water often possesses.

There are various sterilisers for the purification of water by boiling, and whichever pattern is used it must be looked after and worked by men who are thoroughly conversant with its mechanism. The Hartmann Steriliser, in which water is sterilised at a temperature from 220°–230° F., is said to have given satisfactory results in German South-West Africa. The Griffiths water steriliser is at present used in the Service. The water is heated to 180° F. and is then cooled, by means of a heat exchange mechanism, to a temperature about 7° higher than it was on entering the apparatus. This steriliser supplies about 60 gallons an hour.

In default of special apparatus, much good effect may be obtained by boiling the water in ordinary camp kettles before use. But if this is done, the water must either be left to cool in the kettles, which should be kept covered during cooling, or shortly after boiling must be poured direct into the men's water-bottles, which should then be at once stoppered. If these precautions are not adopted, fresh bacteria may enter the water and the benefit obtained by boiling may be lost.

While boiling is of immense service in standing camps, the next method, viz. filtration, will probably be of more practical service with troops, at all events with large bodies of troops, which are on the move.

(*b*) *Filtration.*

There are many excellent filters, of which the " Berkefeld " is perhaps the one most generally known. The general principle of this filter is that the water is pumped through a layer or " candle " of baked infusorial clay, the pores of which are so minute that the bacteria are unable to pass through and are retained on the surface of the " candle."

Berkefeld Filter.

The different parts of this filter are given below and can be seen in Plate 51, Figs. 1 and 2 (p. 601).

The Berkefeld Army Filter has a capacity of 20–25 gallons per hour. The same firm manufacture similar filters of smaller capacity.

The tinned case A has an inlet from pump B and flush-tap C at the bottom ; the filtering cylinder D is fixed in the lid E by means of a winged screw nut F, and has the bent tube G to deliver the water after filtration. This tube has a nozzle with two outlets, each of which is provided with a piece of india-rubber tubing for use in filling the water-bottles. The pump is a semi-rotary pump with gun metal air-vessel H and a piece of suction hose I attached to it. The pump can be opened by unscrewing the four bolts and lifting off the round face-plate.

To get the Filter ready for Use after Transport or Cleaning.

Take off the lid of the filter case ; pass the short outlet tube of the filtering-cylinder (without removing the small india-rubber washer) through the hole in the lid so that the washer rests against the inner side of the lid, and fix the cylinder by screwing the winged nut tightly against the outside of the lid ; replace the lid, taking care that the large india-rubber washer rests properly in the groove provided for it, and screw down the fly nuts evenly. When screwing down it should be observed that the metal rings (washers) under the fly nuts must rest on the projections of the lid and not under it against the rubber washer.

When and how to clean the " Berkefeld."

This filter will require more or less frequent cleaning, according to the quality of the water to be filtered, owing to all

PLATE 51.

BERKEFELD FILTER.

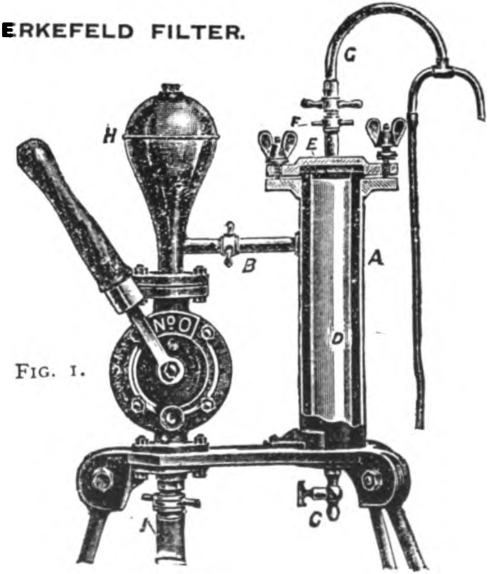
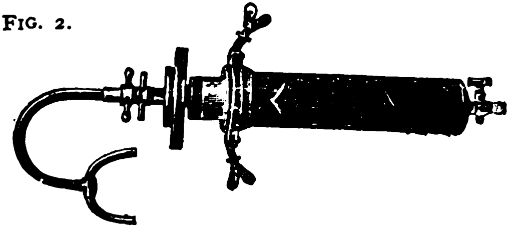

G
H
F
E
Nº0
B
A
D
C
N

FIG. 1.

FIG. 2.



the impurities collecting on the outside of the filtering cylinder and thus producing a slimy coating. The filter itself will indicate when it requires cleaning by the output becoming less and by the greater force which is required to work the pump.

To clean the filter procced as follows :—

Open the filter case, lift out the filtering cylinder, detach it from the lid, and while holding it firmly in the left hand give it a good brushing all round with a piece of the loofah supplied for this purpose or with a moderately hard brush, afterwards rinsing it with clean water. Care must be taken that no soap, oil, or grease of any sort comes in contact with the filtering cylinder.

The Slack and Brownlow Traveller's Pump Filter.

The filtering-tube is fixed inside the larger cylinder of the pump, as shown in Plate 52, being very dense all impurities are arrested on its surface. Impurities can be easily removed by sponging, or by rubbing with the loofah, using clean water; great care must be taken that no oil or grease comes in contact with the filtering-tube, which should occasionally be sterilised by placing it in cold water and raising the water to boiling-point.

How to use the Filter.

The legs having been securely fixed, place one foot through the stirrup, take hold of the filter by the air-vessel above the pump with the left hand, and with the other hand work the handle of the pump at the rate of about 20 to 25 strokes per minute.

In the Slack and Brownlow Field Service Filter the water is clarified by being pumped through layers of cloth before it reaches the filtering material.

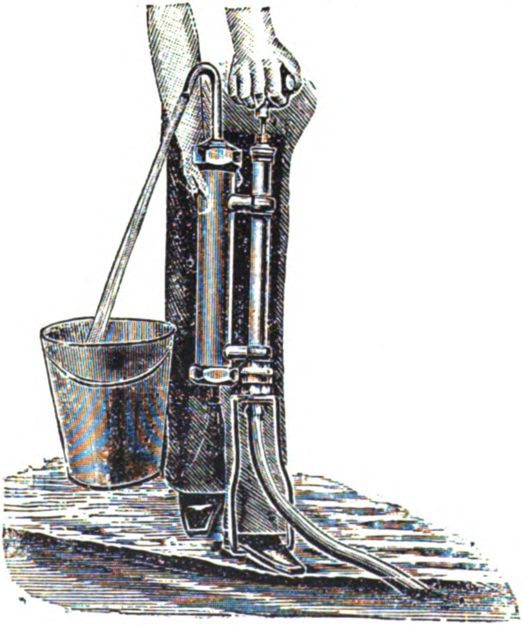
In the new pattern Service water-cart the water passes through layers of asbestos before it is actually filtered.

The New Filter Cart (*F.S.*).

The Brownlow Patent Filter Water Cart produces excellent water and has been tried successfully over very rough country.

PLATE 52.

SLACK AND BROWNLOW'S PUMP FILTER.



The time required to fill the cart with clean water is from 25 to 30 minutes, while the output of filtered water when the cart is filled, is 100 gallons in the first hour and 200 in an hour and a half.

Precautions with all Filters.

The following precautions must be carefully observed with regard to all filters :—

1. All sand, mud, etc., must be removed from the water before it is passed into the filter, otherwise particles will be deposited as a layer on the surface of the filtering material, and the apparatus will rapidly become choked and useless.

This preliminary cleansing of the water may be effected by straining it through a barrel or basket containing charcoal, or sand and gravel, or, failing these, by means of two barrels of different sizes, arranged as in Plate 53 (p. 605).

Holes should be bored in or near the bottom of the outer barrel, and around the upper part of the inner barrel, the space between the two barrels being filled with fine gravel, or better still with layers of coarse gravel, charcoal, and fine gravel.

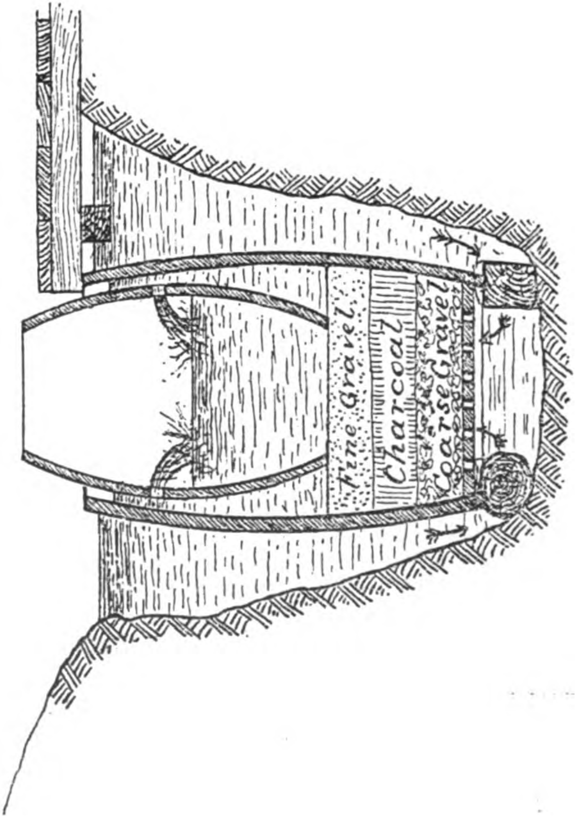
The barrels should be sunk in a stream, and the water by passing through the gravel and charcoal will become roughly filtered before it enters the inner barrel, from which it can be drawn off.

2. "Berkefeld" and other filters must be thoroughly and carefully cleansed at regular intervals, say twice weekly.

This is best done by removing the "candles" of filtering materials and scrubbing their surfaces with a brush, after which they should be placed in cold water and the water heated to boiling-point, and maintained at that temperature for at least one minute.

3. The care and working of filters should been trusted only to men who understand their mechanism and who realise the importance of keeping them in efficient working order.

PLATE 53.


Fine Gravel
Charcoal
Coarse Gravel

Method of filtering water

(c) *Treatment with Chemicals.*

Muddy water can be clarified, but not sterilised, by the addition of alum. A table-spoonful of alum added to a bucket of water will cause the mud to sink quickly to the bottom, and the water can then be readily passed through a filter.

Permanganate of potash has been used for some years in India for purifying water, and has certainly a beneficial effect if sufficient crystals be added to the water to give it a pale pink colour. This method cannot, however, be relied on to make the water fit for drinking.

Various other methods have been recommended for purifying water, of which possibly the best is Vaillard's. This method, in which the water is purified by the action of free iodine, is known as the "red, white, and blue" method and is carried out as follows :—

A red and a blue pastille are added to half a wineglassful of water, in which the pastilles dissolve, forming a brownish liquid. This is then added to 1 litre (1¾ pint) of any water which requires purification and left for ten minutes, the water being shaken occasionally. A white pastille is then added, on which the water rapidly becomes clear.

This method appears to be very effective in purifying water, and the materials are easily carried; an ordinary match box holding sufficient pastilles to purify 20 gallons of water.

Care of Water-bottles.

The care of the men's water-bottles is a matter of extreme importance.

These bottles should on no account be filled with any water except such as has been effectually purified by one of the methods specified above or by some other approved method. Regimental officers and N.C.O.'s should see that all water-bottles are thoroughly cleansed at regular intervals, say once a week. Cleaning is best carried out in the following manner :—

Fill the bottle three parts full of boiling water, letting it stand for five minutes and shaking thoroughly at intervals; repeat the process three times.

Control of Thirst.

The power of controlling one's thirst on the march is very largely a matter of habit. Every man should practise this.

If a man once begins to drink during an early stage of the march, the desire to do so at frequent intervals will be very much greater than if he had not yielded to the first feeling of thirst.

A plum stone, a pebble, or a piece of lemon, if obtainable, will, when carried in the mouth, prevent thirst to a considerable extent.

When men have learnt to breathe only through the nose there is far less thirst than when they march along with their mouths open, sucking in all the dust and dry air until their throats are parched. This is one of the great objections to singing on the march.

2. Care of Food.

Necessity of Protection from Contamination.

The food on field service is usually perfectly good when issued, but in order to keep it good, it is essential that it should be protected from contamination.

If food is exposed to dust or flies, it will almost certainly be contaminated and become a source of disease.

Precautions against Contamination.

Among the precautions which should be taken against the contamination of food are the following:—

Meat from the moment of killing should, as much as possible, be covered up so as to protect it from both flies and dust. Though there are certain advantages in letting meat hang before being cooked, it must be remembered that every hour of exposure makes it liable to contamination unless it is carefully protected. Should it not be possible to protect the meat, it should be boiled before being eaten rather than merely fried.

Grocery rations should not be issued to the men until just before they are to be eaten, and if the men do not eat them at once they should be told to keep them rolled up or covered.

Flies are not much attracted by either bread or biscuits, but since these are liable to dust they should be covered up as much as possible. A tin of biscuits if opened and not finished should be covered at once.

Those kinds of fruit which have no thick skins to protect them should always be cooked before being eaten; all vegetables should certainly be boiled.

3. Flies.

Disease spread by Flies.

Disease is spread, to a considerable extent, by means of flies and other insects. Flies frequent latrines, and unless these places are very carefully tended as regards cleanliness, obtain access to the excreta, and the disease bacteria which are swarming in the filth adhere to their wings and legs. Then if the flies afterwards settle upon food or drink, the bacteria drop off their legs and bodies and lodge in the food or drink, thus tending to spread the disease.

Flies lay their eggs in refuse matter, especially in horse dung. The mature fly is developed from the egg in fourteen days.

Precautions against Spread of Disease by Flies.

The following measures should be taken to prevent the spread of disease by flies:—

Firstly, the insects should be, as far as possible, prevented from breeding; on this account no refuse or horse litter should be allowed to remain in the vicinity of a camp.

Secondly, the latrines should be kept in good order, and the excreta covered, thus ensuring that the insects do not come in contact with the disease bacteria; and

Thirdly, flies should be prevented from gaining access to food or drink.

4. Dust.

Dust favourable to Flies.

Dust-storms, both in India and Africa, probably aid largely in the spread of enteric fever.

It has been proved by experiment that the bacilli which cause enteric fever are able to live in dry dust for no less than three weeks, and consequently it can be realised how important it is that food and drink should be protected from dust.

5. Soil Pollution.

Disease attributable to Soil Pollution.

The spread of disease during a campaign is largely attributable to soil pollution. The contamination of food and drink by the germs of disease, whether conveyed by flies, dust or other channels, depends primarily on the presence of the disease bacteria in the soil in which they have been deposited from the excreta of affected persons.

The bacteria of enteric fever are present in large quantities in the urine of a person who is suffering from this disease. They are excreted by a person for some days before he shows any signs of suffering from the disease.

Precautions against Soil Pollution.

It will thus be seen how important it is that no man, whether healthy or not, should use any place other than a latrine or urinal for the purposes of nature, because if he is allowed to do so the ground will become contaminated, and probably the next shower of rain will wash any germs of disease into the nearest water supply with disastrous consequences.

For this reason, when on the march trenches must always be dug at any halting place, even if the troops are only remaining there for half an hour. The men must not be permitted to use any other place.

Before moving on after a halt, these trenches must be filled in, and their site marked with the letter L formed with stones, etc.

In all camps a thorough supervision of the latrines and urinals must be carefully carried out. It is not a pleasant duty, but it is nevertheless imperative, since on it depends very largely the prevention of disease.

Construction of Latrines.

Latrines should be on the leeward side of the camp and as far away from the kitchens and water supply as possible, at least 100 yards. They should not be on a site from which drainage can be carried in the direction of any water-course and they should be on ground which is not liable to be flooded during heavy rain.

Forms of Latrines.

Latrine trenches should be arranged in one line, as shown on Plate 54, Fig. 1; 2½ feet clear space should be left behind each trench, which is dug 3 feet long, 1 foot broad, and 1 foot deep. Allow five such trenches for every 100 men; if number of men exceeds 500, then allow three trenches for every 100 men.

After use on the second day, the trenches first made are filled in and fresh ones dug in the intervals between the original trenches.

On the third day these are filled in and a fresh row similar to the first is constructed 1 foot to the front and parallel to it.

When for exceptional reasons deep trenches are necessary they should be provided with pole seats, *vide* Plate 54, Fig. 2, which should be cleaned daily—with cresol solution, if available.

PLATE 54.

FIG. 1.

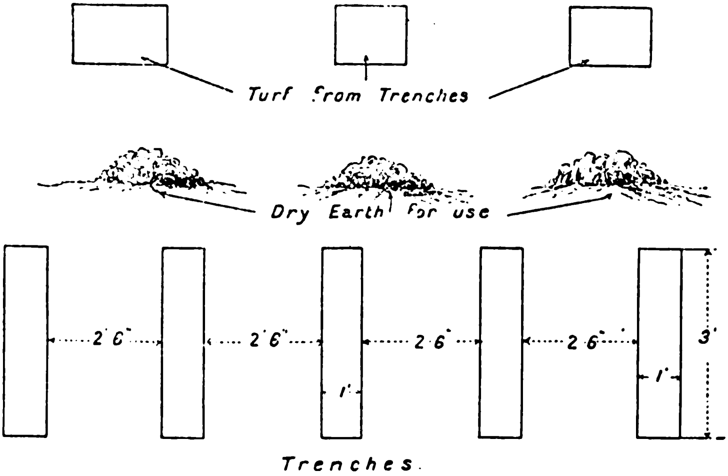
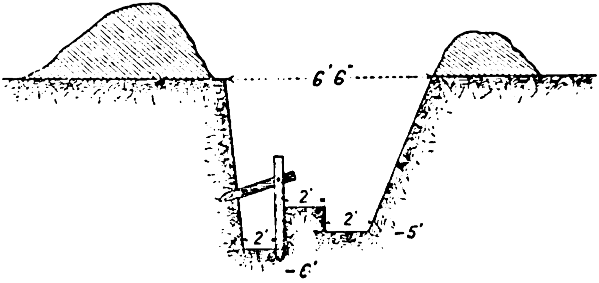

Turf from Trenches
Dry Earth for use
2' 6"
2' 6"
2' 6"
2' 6"
3'
1'
1'
Trenches.

FIG. 2.



Any dry earth dug out should be piled at the side, so that a little may be thrown into the trench by each man after use, and earth should in addition at least twice daily be thrown freely into the trenches by a man told off for the purpose. For general use as disinfectants, cresol solution and chloride of lime are the most efficacious. To use cresol, mix 1½ ounces of cresol solution with 1 gallon of water.

Small pits to be used as urinals may also be dug at both ends of the latrine, but a better method of constructing a urinal is to dig a shallow trench leading into a pit filled with stones, the trench being for use and the pit to act as a cess-pit. Two trenches, 6′ long, 1′ deep and 1′ wide, with a slope towards the pit of about 1″ in every foot, is sufficient for about 900 men. The pit should be about 3′ deep and 2′ in diameter, and should be screened round to prevent men using it instead of the trench. The trench lasts about two days, and the pit about 14 days.

At night tins or tarred buckets should be placed in the camp close to the tents to serve as urinals and emptied into the urine pits in the morning. Sufficient latrines should be constructed to seat, if possible, 5% of the troops, one yard per man being allowed for the deep latrines. For the shallow land, as a rule, 5 trenches should be provided for 100 men for one day, although 15 trenches (*i.e.* 3 per cent.) will suffice for a strength of 500 men.

Removal and Destruction of Refuse.

No refuse of any sort should be permitted to lie anywhere about a camp or its vicinity. Receptacles for refuse should be placed at certain spots in the camp and the refuse removed from them daily and burned.

" Burn what you can, and bury what you can't," is a good principle on which to act.

Either of the following methods are suggested as convenient methods of burning refuse :—

(*a*) Set up a Jones' Leon Gabion or construct a cylinder about 4′ high of sods, with holes in the side to act as air inlets. Light a fire inside and throw on the refuse.

(*b*) Construct a circular pit, 3–4′ deep and 18′ in diameter. Build a loose stone wall all round the inside of the pit, reaching to a height of about 1′ above the ground level, banking up the excavated earth against it. Cover the bottom of the pit with loose stones and build a vertical cone of stones 4–5′ high in the centre. Light a fire and after the stones have become hot throw in the refuse.

Kitchen refuse should never be thrown on the ground outside the kitchen.

Lieut.-Col. Elkington in his "Notes on Military Sanitation," advises that a shallow pit should be dug and branches of brushwood laid thickly on the top, so that when greasy or dirty water is thrown on it the refuse matter is retained by the brushwood, and only moderately clear water is passed through. The brushwood should be burned daily in the camp kitchens.

Canadian Incinerator.

(1) Two trenches are dug, each 9 feet long and 1 foot wide, intersecting at right angles at their centre, thus forming 4 trenches, each 4 feet long, with a centre chimney 1 foot square.

The trenches are 1 foot 6 inches deep at their distant ends, and slope up to a depth of 1 foot at the centre or chimney end.

(2) Across the central hole or chimney 8 or 10 pieces of old iron rods or iron barrel hoops are laid crosswise.

(3) Boards or pieces of wood are placed across each trench from the chimney outwards for 2 feet.

(4) A barrel with the head and bottom removed is now placed standing over the central opening, and well packed and plastered around with clay and sods, forming a cone or beehive shaped structure, 2 feet wide at the base all round the

barrel. This structure is supported over the trenches by the boards or pieces of wood.

When a good plaster of clay cannot be obtained, manure, etc., mixed with chopped straw will answer.

After a while the barrel will become charred and destroyed by the fire, leaving a hard-baked central chimney.

The iron supports supplementing the wood across the trenches are placed there in the event of the structure caving in after the supporting boards are charred. This, however, is not likely.

The chimney may, of course, be built without a barrel.

Working of Incinerator.

Three of the open ends of the trenches are blocked up with sods, leaving open the end of the trench facing the wind.

Through this a fire is kindled under the central opening.

Refuse is now thrown down the chimney. This refuse falls down and partly rests on the iron bars above the fire, and is dried there and partly burned before falling into the fire to act as fresh fuel.

Great care must be exercised in feeding the refuse to the incinerator. This should be done gradually, so as not to choke the fire. The ashes and calcined portions of inconsumable articles should be frequently raked out.

To get the best results the same men should be constantly employed so as to become skilful in the management.

Prevention of Malaria.

Cause of Malaria.

Malaria is extremely prevalent in India, and certain other parts of the world. It is caused by a minute animal organism which is conveyed from the blood of one person to that of another by means of a particular species of mosquito—the Anopheles. These mosquitoes breed in water, especially in stagnant puddles, in which they lay their eggs. The mature mosquitoes are developed from these eggs in about a month. The female mosquito alone is a blood sucker. After having fed on the blood of a person who is suffering from malaria she conveys the parasite to the next person on whom she feeds.

The commoner varieties of mosquitoes feed throughout the day and night, but the Anopheles mosquitoes chiefly feed between sunset and sunrise, and do not fly more than about ¼ mile from the water in which they have been hatched.

Preventive measures against Malaria.

The following are the preventive measures which may, in the absence of medical advice, be taken against malaria :—

(1) Maintain the general health by avoidance of chills, over-fatigue, etc.

(2) Seek protection from the bites of these mosquitoes by sleeping under mosquito netting, as was done by the Japanese in Manchuria. A little ordinary kerosene oil placed on the hands, face, and other exposed parts, before going to bed, will to a great extent serve to keep off the mosquitoes.

(3) See that no stagnant pools or collections of water are permitted to remain in the vicinity of the camp, because such water will certainly serve as a breeding place for large numbers of mosquitoes. Any such collections of water should be drained, or, if this is not practicable, should have some kerosene oil poured on the surface twice weekly. The oil will destroy any eggs or immature mosquitoes floating on the surface of the water.

(4) Unless it is unavoidable, camps should not be situated at the least nearer than ¼ mile from villages or houses, especially if the inhabitants are known to be fever-stricken.

(5) Avoid going out in the evening.

(6) Since quinine kills the parasite one can, to a great extent, safeguard oneself against malaria by taking regular doses of quinine.

Probably one of the best methods of taking quinine effectively without unpleasant results is to take 15 grains in the morning on two successive days, and after an interval of eight days again take two successive doses, and continue this practice while remaining in a malarial country.

Other methods are to take 4 grains of quinine daily or 15 grains once a week. Where an individual is liable to relapses from former attacks he should consult a medical man as to the proper dose.

The above are only simple rules for preventing malaria. It cannot be too strongly urged that a medical man should be consulted whenever an attack of malaria breaks out.

Health of Troops while Marching.

Open Formation in Warm Weather.

If marched in close formation, men become much more quickly tired and are also more liable to suffer from heat stroke than if marched in open order. Hence in warm weather open formation should be adopted whenever possible.

Halts.

Short halts at frequent intervals are much better than occasional long halts. If men are halted for a quarter of an hour on the completion of the first two miles, and are afterwards rested for ten minutes every hour, they will be much less fatigued and less stiff at the end of a long day than if they had been given fewer halts of longer duration.

Care of the Feet.

The care of the feet is obviously an important matter.

Socks should fit well and should be removed at the end of a march whenever possible and a dry pair put on after the feet have been well washed and dried.

The feet may be considerably hardened by soaking in alum and water or, if this is not obtainable, in salt and water.

Soaping the inside of socks will greatly add to the comfort of walking if a man is inclined to become footsore or if his boots rub him.

If feet perspire very much, a dusting powder is very useful. A good powder for this purpose consists of equal parts of boric acid, oxide of zinc, and starch. In cases of soft corns this powder is also useful for dusting between the toes.

The main point in the care of the feet is to prevent blisters from forming. Officers should invariably inspect the men's feet after a march, and send all those with blisters to the medical officer. If a blister forms, prick the extreme edge with a clean needle, let the fluid run out, and then press the skin down over the blister, and dust on some of the powder just mentioned.

Clothing.

Always wear a dry flannel belt at night. It helps to ward off chills. It may, with great advantage, be worn in the daytime as well.

After a long march, one should, whenever possible, change into a dry shirt before lying down for the night.

Cooking.

Indigestion and diarrhœa, although in their milder forms comparatively insignificant by themselves, lower a man's resisting power and render him more liable to contract a serious disease, such as enteric or dysentery.

For this reason, amongst others, good cooking of all food, and variety in the nature of it, are important points.

A knowledge of elementary cooking is easily gained, and, once acquired, renders a soldier much more independent and better able to look after himself when on outpost or other detached duty. Every man, therefore, should be able to cook a meal for himself. (*For methods of cooking and recipes, see pp.* 651–658.)

When tinned foods are issued, the tins should always be carefully inspected before use, and any which are bulged or indented to a degree which might admit air, or which sound hollow when struck, should be at once rejected.

While actually on the march, food should only be taken in small quantities, the principal meal of the day being eaten after arrival in camp.

Alcohol.

As regards the advisability of using alcohol on active service, different views have been expressed. Most authorities, however, now strongly hold the opinion that alcohol should be used sparingly, and then only in case of necessity.

Alcohol is, no doubt, useful sometimes, as, for instance, at the end of a long and tiring day, but, as a general rule, it is productive of much more harm than good. In cold climates it should never be taken with the idea of keeping the body warm, because in this respect it has been conclusively proved to be ineffective.

Reporting Sick.

Men should always report sick on the first sign of illness. If this be done, an attack of disease may frequently be warded off or cut short by treatment.

PART XIII.

SUPPLY AND CAMP COOKING.

SUPPLY.

Selection of Site for Supply Depot.

In selecting sites for supply depôts attention should be directed to the following points :—

(*a*) The site should be dry and of sufficient area to permit of any probable expansion, and level enough to allow tramway or railway lines and roads to be laid where required ;
(*b*) There should be a good supply of water ;
(*c*) The facilities for lighting should be good ;
(*d*) The site should be as close as possible to wharves, railway sidings or main roads, and the approaches should be good ;
(*e*) Sufficient storage accommodation in the way of buildings, sheds or barns should be available for perishable supplies and medical comforts.

A supply depôt for an infantry brigade would probably occupy a space of 120′ by 75′.

Methods of Storing Supplies.

Bread should not be stacked in more than 3 layers.

Biscuit boxes may be stacked on the triangular system shown in Plate 55, of which the following is an example : 6 rows of 8 cases forming the ground layer, 5 rows of 8 cases the 2nd layer, 4 rows the 3rd, 3 rows the 4th, 2 the 5th, and 1 the 6th or top layer.

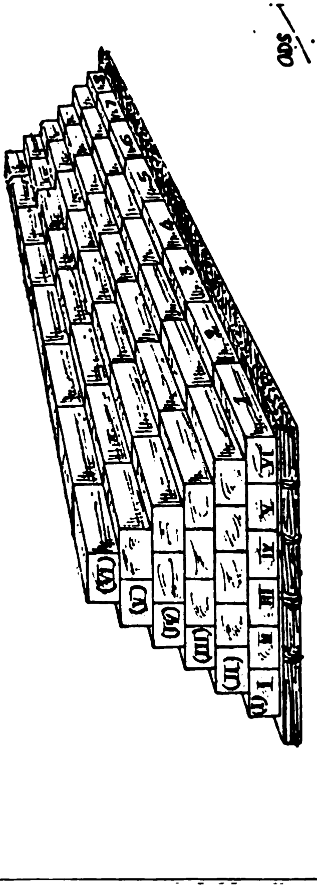
The advantage of the triangular system lies in the facility with which stock can be taken. This is done as follows :—

$$\frac{\text{Length in number of boxes)} \times \text{breadth (in number of boxes)} \times \text{height (in number of boxes)} + 1}{2} = \text{total number of boxes in stack.}$$

Thus in the example given on Plate 55 we have :—

$$8 \times 6 \times \frac{6 + 1}{2} = 168.$$

PLATE 55.


1
2
3
4
5
6
7
8
I
II
III
IV
V
VI
(I)
(II)
(III)
(IV)
(V)
(VI)
ADS

TRIANGULAR SYSTEM OF STACKING BISCUIT BOXES, ETC.

Groceries, Medical Comforts and Flour should, where possible, be stored under cover.

Hay. If the quantity to be stored is not very large, it may be stored on the triangular system. If there are large quantities it should be made up into stacks of 277 trusses each. The first layer should consist of 40 trusses in 8 rows, counting lengthwise of 5 trusses each. The next layer should consist of the same number of trusses laid crosswise. The trusses in the 3rd and 5th layers should be of the same number and laid in the same way as the 1st, the 4th the same as the 2nd. The 6th layer should consist of 30 trusses laid in the same way as the 2nd and 4th layers. The 7th of 24 trusses should be laid in the same way as the 5th, the 8th of 15 trusses laid in the same way as the 6th, while the 9th of 8 trusses forms the ridge. A foundation should be formed of faggots or other dry material to keep the hay off the ground and a sailcloth should be spread over the whole stack.

Meat should be kept in a cool and well ventilated store.

Oats and other grain should be stacked on the triangular system on a foundation of good dry material not less than 9 inches thick and covered with a sailcloth. The mouths of the sacks should be laid inwards. If the space is very limited, oats may be stacked in the same way as hay.

Demand on Civil Authorities for Supplies.

A.F.F. 780.

I, , commanding at , hereby direct the Local Authorities of , to supply for the requirements of the troops, the following :—

to be ready at , on the day of , precisely at o'clock, under the direction of an official appointed by the Local Civil Authorities for this duty, who will make delivery to the troops in accordance with instructions which will be addressed to him by me.

* Payment will be made on production of the requisition receipt notes, which must be presented at

In case of any disobedience on the part of the inhabitants in complying with the demands, the Local Civil Authorities will address the undersigned without loss of time in order that Military Force may be supplied if necessary.

Place

Date

Signature of officer commanding Troops.

Requisitioning Supplies.

The following is the universal form of requisition for all supplies.

Army Book 361.

REQUISITION RECEIPT NOTE.

(NOT NEGOTIABLE.)

No.____________ Date____________________

Requisitioned from (full name)________________________________

Address________________________________

For the use of________________________(Division, Brigade, Column, Regt., etc.)

Title and date of Account in which articles will be taken on charge } ________________________________
____

---

* To be struck out if payment is not to be made.

Articles or Services requisitioned.	Quantity.	Quality (good, average, or indifferent).

Signature, rank, regt., etc., of }
Requisitioning Officer }

Instructions to Holder.

The recipient of this Note is required to deliver it up to the Officer in command of the nearest British garrison as soon as possible, and at the very latest within one month from date of receiving it. He will receive from that officer an acknowledgment for the Note, which he can retain while the latter is passed on to the proper quarter as required by the British Army Regulations. Should he neglect to obtain this certificate, which is intended to safeguard his interests in case of accident to this Note, any consequences that may ensue will be his own fault. He is informed that this requisition Receipt Note will be examined and inquired into, and that he will receive a notice stating whether payment for the articles or services requisitioned will be made, and if so when he may expect to receive payment. Should he not receive this notice within one month of handing in this Requisition Receipt Note, he may apply again to the Officer in command of the nearest British garrison, and request that the matter may be inquired into.

No payment can be made under any circumstances whatever until this Note has been handed in.

This Note is merely a record and implies no promise to pay.

Directions as to the issue of Requisition Receipt Notes.

The following are the official directions to officers issuing requisition receipt notes :—

1. A supply of requisition receipt notes in the above form

and printed in English, with instructions to holder on the back, will be issued by the central requisition office at the commencement of operations. A further supply, printed in the language of the country, will be issued as soon as possible.

2. The articles requisitioned must be fully described, so as to give all information necessary for the guidance of the officer who will settle the claim. The weight of the goods taken must in all cases be estimated and inserted on the note; it is not sufficient merely to state the number of bags or cases.

3. The space left for "title and date of account, etc.," is always to be filled in.

4. No money value is to be quoted on the requisition receipt note.

5. A duplicate of the requisition receipt note will invariably be made out (carbon paper is provided for the purpose).

6. All supplies, stores or stock requisitioned should be handed over, with duplicates of the requisition receipt notes, to the representative of the service or department concerned, who will forward it to the Central Requisition Office.

When it is impossible to hand the goods over, the duplicates of the requisition receipt notes should be sent to the representative of the service or department concerned, a special report being made to that officer on the matter. This report will be supported by vouchers showing how the goods have been disposed of.

7. In the special cases in which goods or stock are requisitioned for more than one service or department, the whole of the articles requisitioned and the duplicates of the requisition receipt notes, should be handed over to the representative of any one of the departments concerned, who will be responsible for the

distribution of the goods or stock to the respective departments or services for which they were requisitioned.

Cattle.

METHOD OF DRIVING CATTLE.

1. *In Open Country.*

Cattle should, whenever possible, be driven only in the early morning or towards the evening. The drovers should be mounted; one or more, according to the size of the herd, should ride in front to prevent any cattle breaking away, while two or more should follow in rear. Cattle should be frequently watered.

2. *In Enclosed Country.*

Cattle should be herded as closely as possible without crowding. It will usually be found that a larger number of drovers will be required than for driving cattle in open country.

Pace and Feeding.

Cattle should not be driven faster than 2½ miles an hour. If they are driven beyond their usual walking pace for some days, they very rapidly fall away in condition and deteriorate in feeding value. Cattle should be allowed to graze or sleep during the heat of the day, and, since they feed well at night, they should be given as much opportunity for it as the situation will allow.

KILLING AND CUTTING UP.*

Time for killing Cattle.

If cattle are killed at once after having been driven a long distance, particularly in hot weather, their blood will become heated and the meat will be tough. They should therefore, if possible, be allowed to rest quietly for at least twenty-four hours previous to being killed.

---

* The Author obtained most of the information on Butchering from Mr. A. Wolsey, Peckham.

They should also not be killed on a full stomach, as in that case the meat does not keep well.

Method of killing Cattle.

In the hands of an experienced man, a pole axe is the best, but in the case of an inexperienced man, it is better to shoot the beast. In either case the animal should be struck in the centre of the forehead 2 inches above a line drawn between the eyes. If available, a "humane cattle killer" may be used with advantage.

As soon as the animal falls its throat should be cut, to allow the blood to flow freely from the veins. The animal should then be gutted.

Method of skinning Cattle.

Cattle should be skinned in the following way:—

The animal should be turned on its back, and a longitudinal slit made in its hide from head to tail. The hide on the legs and brisket should then be slit down on the inside of the legs, after which it can be gradually pulled down towards the back on both sides. The head and lower joints of the legs should then be cut off.

To slaughter and dress a bullock: 3 men are the best number.

Method of cutting up Cattle.

1. *When Proper Instruments are available.*

The usual instruments are a small hatchet or axe, a saw, a sharp knife, and a steel for sharpening.

The carcase should be divided with the axe and saw into two sides, by cutting the chest bone or sternum through, and dividing the back bone or vertebræ.

The sides may be hung as shown in Plate 57, though if more convenient they may be at once divided into fore and

PLATE 56.

QUARTERS AND JOINTS INTO WHICH ANIMALS SHOULD BE CUT UP.

Fig. 1.

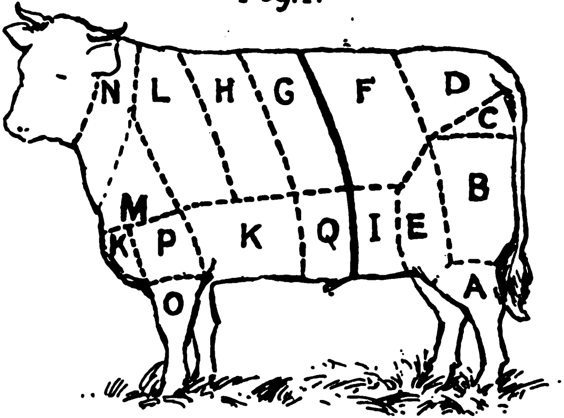

N
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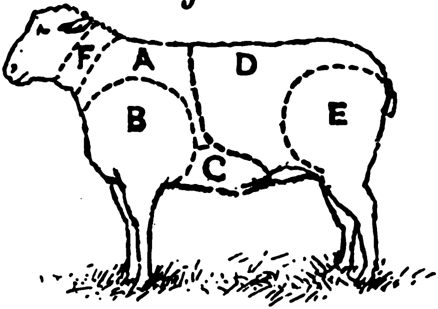
Fig. 2.



hind quarters, by dividing them at the beginning of the long bones, *i.e.* between the 1st and 2nd rib, and follow line between G and F, and Q and I on Plate 57. Each side of beef consists of the following joints :—

See Plates 57 and 58.

Hind Quarter.

		Suitable for :—
A	Leg.	Stewing only.
B	Buttock or round, which is situated below the aitch bone, and includes part of the thigh bone or tibia. This can again be divided into (1) top side, and (2) bottom or silverside.	Topside : roasting or steaks. Bottom or silverside salting and boiling.
C	Aitch bone, which is below the rump at the hind part.	Roasting.
D	Rump, which extends from the aitch bone to the first bone of the sirloin.	Roasting, or baking, or frying. More suitable for prime steaks.
E	Thick flank.	Roasting or stewing. Also suitable for steaks.
F	Sirloin, consisting of part of the loin or back, *i.e.* 6 joints or lumbar vertebræ, down the side of beef from the rump and 1 dorsal vertebræ and rib, making 7 joints.	Roasting or baking.
I	Thin flank = end of 13th rib.	,, ,,

Fore Quarter.

G	Fore rib consisting of 5 joints or dorsal vertebræ and 5 ribs.	,, ,,

PLATE 57.

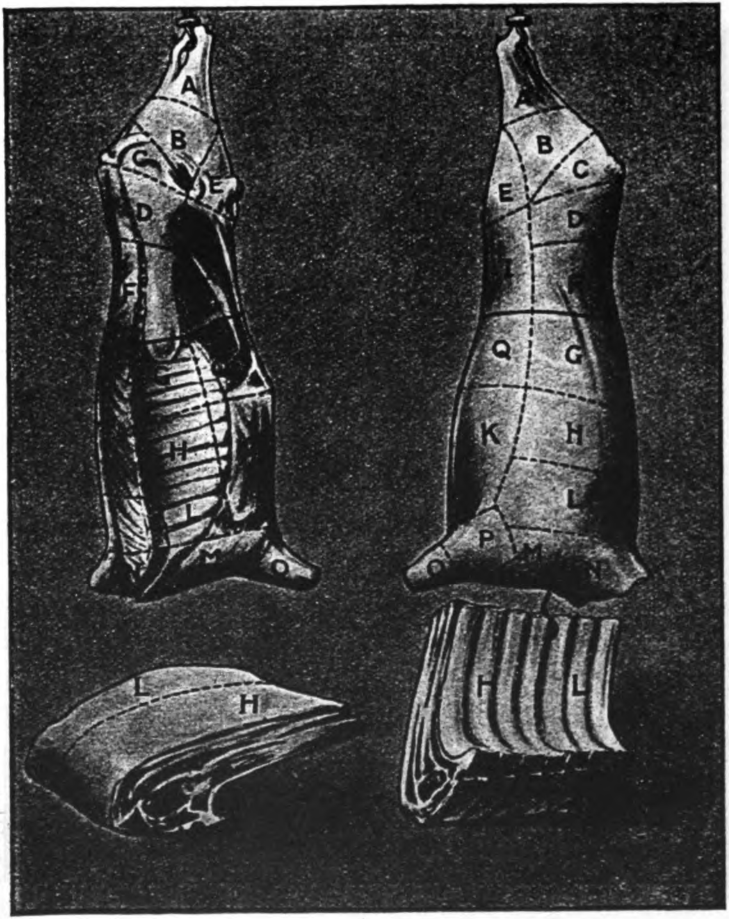

A
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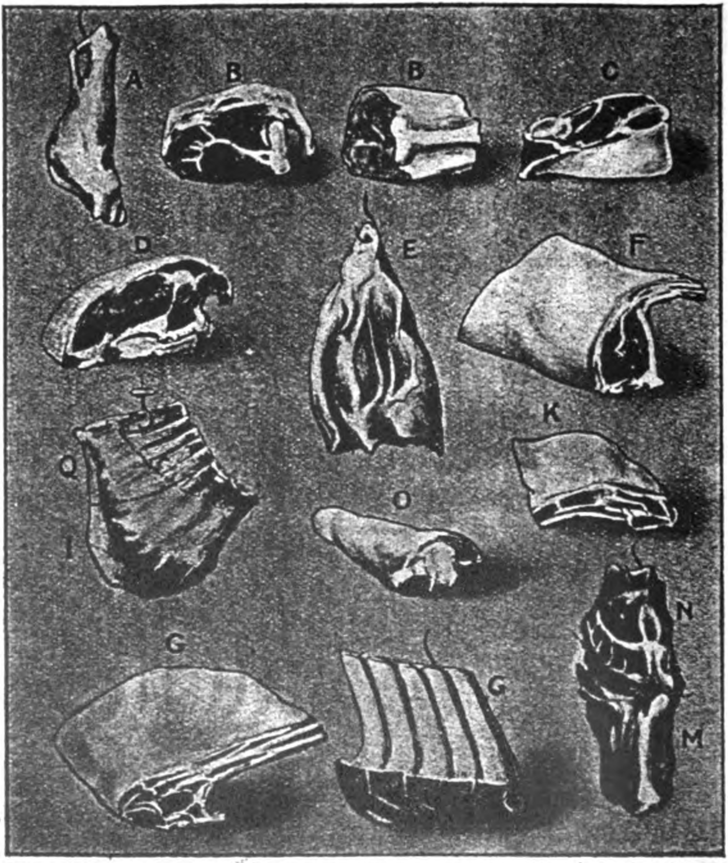
PLATE 58.


A
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G
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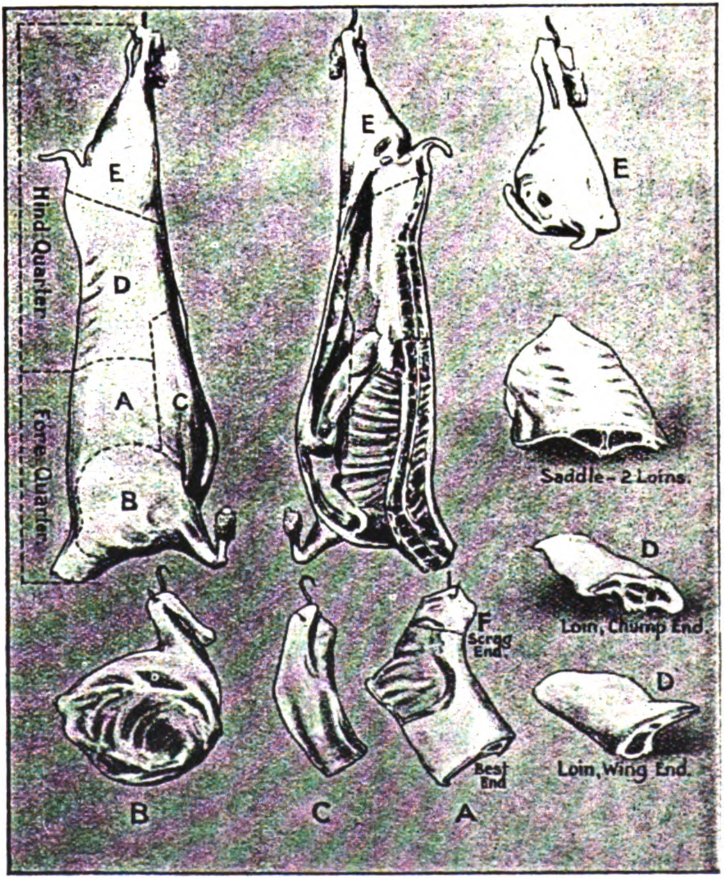
PLATE 59.


Hind Quarter
Fore Quarter
E
D
A
C
B
E
E
Saddle - 2 Loins.
D
Loin, Chump End.
D
Loin, Wing End.
F
Scrag End.
Best End
B
C
A

		Suitable for :—
H	Middle rib, consisting of 4 joints or dorsal vertebræ and 4 ribs.	Roasting or baking.
Q	The plate = lower end of 5 ribs.	,, ,,
K	Brisket = lower end of 7 ribs.	Roasting, baking, or salting.
L	Chuck, consisting of 3 joints of dorsal vertebræ and 3 ribs; 2 neck or cervical vertebræ, and bottom end of shoulder blade or scapula.	Roasting, baking, or stewing.
M	Clod.	Roasting, baking, or stewing.
N	Neck or sticking, consitsing of 5 joints of cervical vertebræ.	Stewing.
O	Shin, half radius and ulna, less 4 inches.	Stewing.
P	Leg of mutton piece, whole of humerus, top of radius and ulna.	Stewing.

Treatment of Beef in very Hot Weather.

Immediately on delivery in very warm weather, the buttock, thick flank, and rump should be cut out and hung up, in order to let the heat out of these parts which are particularly liable to turn bad. The large piece of cod fat on the buttock should be cut off and split open.

2. *When only a Knife is available.*

If a knife is the only instrument available, the best course is to cut the meat away from the bone as cleanly as possible, being guided generally by Plate 56.

If, say, only 10 lbs. of meat is required, the easiest place to cut it from is the buttock (B on Plate 56).

Number of Rations in an Ox or Cow:

Ox, 500–600 lbs. Cow, 350–400 lbs.

Yield of Meat compared to Live Weight.

Fat cattle yield 62–67 per cent. of their live weight.

Cattle in good condition yield 59–60 per cent. of their live weight.

Cattle in fair condition yield 53–55 per cent. of their live weight.

Heifers yield 54 per cent. of their weight in meat.
Milch cows 46 ,, ,, ,, ,,
Calves 60 ,, ,, ,, ,,

It may be roughly calculated that in a side of beef $\frac{1}{8}$ is bone and $\frac{7}{8}$ meat.

Short Directions as to inspecting Beef.

When inspecting beef the following should be noted:—

The meat should have a bright and fresh appearance and be well covered with fat, especially on the cod (*i.e.* the large piece of fat situated on the buttock). There should also be a fair amount of kidney suet.

The udder should never be removed from a side of beef, as it is a sure sign of whether the side is that a heifer or a cow.

In ox beef the pizzle should never be removed, since it is the surest way of telling an ox from a bull. In army contracts bull beef is forbidden.

Frozen or chilled beef or mutton, if the frost is still in it, can, of course, be recognised by its cold feeling, and a wetness on the surface. When it has been thawed out, the meat has a dull and damp appearance.

To test a side of beef for sweetness: thrust a wooden skewer into the meat till it touches the round bone of the buttock, as this is the meat which is always the first to turn. If this is sweet, the rest of the side may be taken as good.

Sheep.

METHOD OF DRIVING SHEEP.

1. *In Open Country.*

If sheep are to be driven in open country, the best way is to drive them in one large flock, but they should never be crowded. If no sheep-dogs are available, the men driving them should walk close on both flanks and in the rear of the flock about twenty paces apart. One or more men, according to the size of the flock, should walk in front in order to head the sheep back if they break away. If they are difficult to drive a man should go through the middle or fore part of the flock and keep some of the sheep moving forward, thus making room for those who are following.

If no enclosed place is available when halted for the night, it will, of course, be necessary to mount a guard over them; but as a rule sheep do not require much attention after being driven.

2. *In Enclosed Country.*

If sheep are to be driven in enclosed country, they should be collected in one large flock. When on the road, at least two men should precede them and two drive them; one man also should walk among the leading sheep to keep them from crowding. If sheep are crowded in the least, they begin to pant, which is the first stage of exhaustion prior to their lying down and refusing to move. In driving sheep in an enclosed country of lanes or roads, it will generally be found that a few sheep are always in front; if these can be kept gently moving forward, the rest will follow easily, but these leaders must not be hurried. In driving sheep the pace of the slowest must regulate the pace of the remainder.

If they are all moving well, and there are men in front, the sheep may be allowed to tail a little and feed as they go along, But obviously this can only be allowed in an enclosed country.

The way to get a flock over or through an obstacle is to drag or lift a few over or past it and hold them gently till the rest are induced, rather than driven, to follow. Driving and pushing always tire sheep.

When halted for the night, the best way to keep them together is to drive them into a field. Provided the pasture is good, a field will carry that number of sheep which, when driven together into one corner, do not occupy more than one-fifth of the whole field. This may be taken as a rough method of estimating the number of sheep which a field will carry.

Pace and Feeding.

Sheep can usually travel two miles an hour, and do from ten to twelve miles a day. If unaccustomed to being driven, a large proportion will rapidly become lame, and these must of course be the first to be killed. Practically the only thing to do in the case of lameness on the march is either to rest, carry, or kill them.

Sheep should, if possible, be allowed to graze for at least an hour after having been driven, say, five miles. They should be allowed to water once a day, particularly if the weather is hot.

KILLING AND CUTTING UP.

Best Time for Killing Sheep.

Sheep should be rested as long as possible before being killed, and then be killed in the cool of the evening.

Method of Killing Sheep.

In the field, sheep should be killed in the following way, the only instrument which is necessary being a sharp knife :—

The animal should be laid on its left side, the butcher holding its jaw with his left hand and then cutting its throat to the bone. The animal should then be gutted.

Method of Skinning Sheep.

Sheep should be skinned in the following way :—

The animal should be turned on its back and the skin first released from the legs and breasts, and then gradually worked down both sides and finished at the back. The head and lower joints of the legs should then be cut off.

Method of cutting up Sheep.

1. *When Proper Instruments are available.*

The usual instruments are a small hatchet or axe, a saw, and a sharp knife. The carcase should be divided into half, and hung as shown in Plate 59, Fig. 2. If it is necessary to divide either side into quarters, the side should be divided along the line between A, C and D, in Fig. 2. The joints into which each half may be cut up are the following :—

	Suitable for :—
A. Neck, best end	Roasting or frying.
B. Shoulder	Roasting.
C. Breast	Stewing.
D. Loin	Chops or roasting or frying.
E. Leg	Roasting or boiling.
F. Neck, scrag end	Stewing.

The joints when cut up will be as shown on Plate 59.

NOTE.—A haunch of mutton is the leg and stump end of the loin in one piece.

A saddle of mutton is two loins.

2. *When only a Knife is available.*

The meat should be cut cleanly from the bone in as large pieces as possible.

When only a Small Amount of Meat is required.

If, say, only 10 lbs. of meat is required, the easiest plan is to cut it from the leg as shown in Plate 56, Fig. 2, p. 627.

Number of rations in a sheep, 50–80.

Sheep yield 50 per cent. of their weight in meat.

Short Directions as to inspecting Mutton.

The same remarks apply as in the case of beef (p 634). There should also not be too much waste fat on the back.

Bread.

Flour should be pale cream white. It should feel soft and dry. The conditions of Army contracts require that a sack of 280 lbs. should produce 182 2-lb. loaves, that is to say, an increase of 30 per cent. more bread than flour. 280 lbs. flour should be the yield from 350 lbs. hard wheat or from 318 lbs. soft wheat respectively.

Bread made with Baking Powder.

Making bread with baking powder is a much simpler process than making it with yeast, and a knowledge of the ingredients is all that is necessary to enable the soldier to make those substitutes for bread with which he is forced to be content in the absence of an oven.

Whether cooked, however, either as bannock on a frying pan or metal plate, as dampers in the ashes of a wood fire, or as bread in an oven, the preliminaries up to the time of cooking are the same, except that the bannock or damper is flat instead of loaf shaped, so that it may be cooked through by heat applied to the side only. Baking powder amounting to rather more than 2 per cent. of the quantity of flour to be used (6 lbs. to 280 lbs.) must be mixed with the flour. A sufficient quantity of soft water to convert the flour into dough is then mixed with the flour and baking powder. A little salt (about 1 lb. for every 70 lbs. of flour) is also usually added to keep the bread firm. As soon as the dough has been made and shaped, it is ready for baking.

Ovens.

Ovens are of two kinds. In one, the fire is kept alight during the whole time that the baking is in progress, whereas in the other kind, of which the Aldershot is a type, the fire, which should be of wood, is only kept burning until the oven is thoroughly heated when the fire is drawn, the food inserted, and the doorway closed and pugged up with clay.

PLATE 60.

FIG. 1.

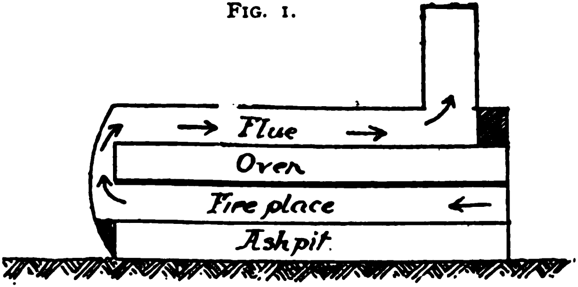
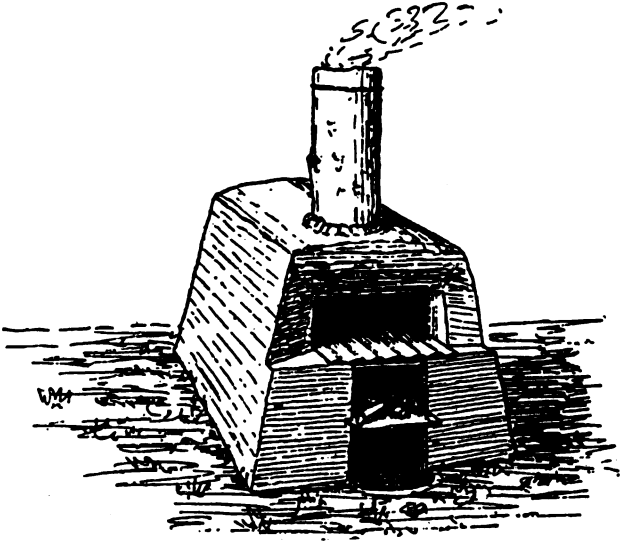

Flue
Oven
Fire place
Ashpit

FIG. 2.



The first of these forms of oven (see Plate 60), which is suitable for a standing camp, may be constructed of simple materials in the following way. Procure three, or if possible four, sheets of corrugated or ordinary iron about 3 feet long by 2 feet wide. Build two walls of brick and clay about 3 feet 6 inches high and 5 feet long, or about 2 feet longer than the iron sheet. When each wall has been built about 9 inches high, one sheet of iron, or if possible two sheets of iron with a layer of clay between them, must be placed across, with the edges resting on the bricks of each wall. A space of two feet will then remain uncovered at one end of the walls. Build the wall another foot in height and insert the second sheet in the same way. Then build another foot and insert the last sheet. Complete the remaining 9 inches of wall. Build across the top, inserting the chimney pipe, which can be made out of some kind of pipe or roll of metal, at the end where the sheets come flush with the end of the walls. Finally build up the back, without filling in the uncovered spaces. The oven is now complete. The fire should be placed on the lowest iron sheet so that the smoke is carried up the space at the back round to the front under the roof and out at the chimney. The oven proper is the space between the two upper plates. The space below the lowest plate forms the ashpit.

The second form of oven is exemplified by the Aldershot oven, which is shown by Plate 61, Fig. 1. It is not worth while to erect this form of oven unless the troops are to be at least two days in camp. It consists of an oblong iron sheet to form the floor, a framework composed of a number of iron bars fitting into the ribs of two semicircular iron arches to form the roof and sides, and two semicircular plates of iron with a circumference corresponding with that of the arches. These last form respectively the back and door of the oven.

A suitable site having been selected, preferably a gentle slope on clay soil, which will become hard during the process

PLATE 61.

FIG. 1.

ALDERSHOT OVEN.

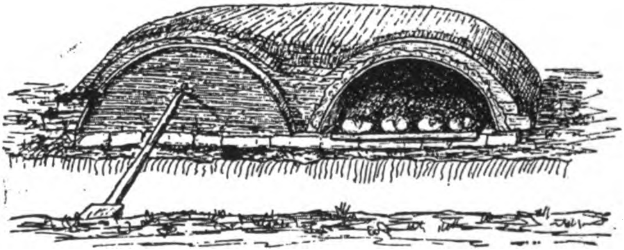
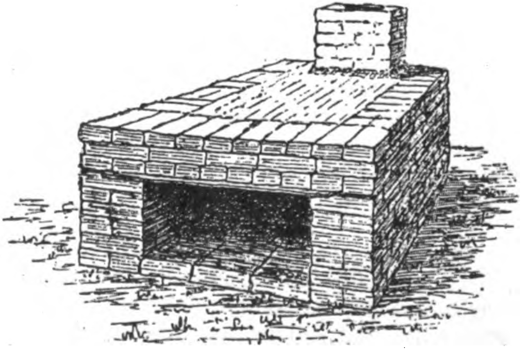


FIG. 2.

IMPROVISED ALDERSHOT OVEN.



of baking, the whole framework, with the exception of the door, is fitted together upon the spot, forming an enclosure with a flat bottom and a semicircular arched roof. Sods or bricks are next built round the back and sides, after which a trench is dug, for the cook to work in, 18 inches deep, 2 feet wide, and 6 feet long opposite to and 12 inches from the doorway of the oven. The soil from the trench, mixed with water, grass, rushes, etc., to assist in binding it, is then thrown over the oven and beaten down till the oven is covered over for a depth of at least 6 inches; 300 lbs. of hard wood should be placed inside in small quantities and burnt to ashes to heat and dry the oven. On subsequent occasions about 75 lbs. of wood will probably be found sufficient. The fire is then drawn, and the provisions inserted. Meat must be put in immediately, and a small tin of water inserted at the same time in order to keep the meat from burning. In the case of bread about 20 minutes should be allowed to elapse so that the maximum heat may subside.

When the dough or meat has been inserted, the door is placed in position and wedged tightly with a pole, the other end of which rests against the farther side of the trench. The edges are then tightly pugged round with wet clay in order to prevent the heat from escaping.

The time required to bake will depend upon the heat of the oven: with a good heat rations for 220 men would be baked in about 2½ hours.

Dishes requiring much cooking should be placed near the back and sides of the oven, those requiring a medium time in the centre, those most easily cooked near the door.

The regulation Aldershot oven bakes 108 1¼ lb. rations at a time.

Many substitutes may be improvised on this principle—scooped out ant-hills, for instance, were frequently used during the South African War. A barrel on its side covered round with clay, and soil beaten down as already described will also answer the purpose very well. In this case the wood of the barrel will soon be burnt, but this will not matter because by that time the clay will be so baked that the roof or sides of the enclosed space will not fall in, but will be supported by the iron hoops alone. There will then be a walled circle of baked clay retaining the heat.

Needless to say, variation in the size of the oven entails corresponding modification in the time and fuel required.

The form of oven depicted on Plate 61, Fig. 2, shows a different pattern of improvised oven which may be used.

Scale of Rations.

Full Scale on Active Service.

Paragraph 27 of the Regulations for the Allowances of the Army, 1910, provides that on active service a special scale of rations, dependent on the climate and the circumstances of the expedition, will be fixed by the General Officer Commanding, but the following scale will, as far as possible, be adopted as a guide :—

1¼ lb. of fresh or frozen meat, or 1 lb. (nominal) preserved or salt meat.
1¼ lb. bread, or 1 lb. biscuits or flour.
4 oz. bacon.
3 oz. cheese.
⅝ oz. tea.
¼ lb. jam.
3 oz. sugar.
½ oz. salt.
$\frac{1}{36}$ oz. pepper.
½ lb. fresh vegetables, or 2 oz. dried vegetables, or 4 oz. preserved fruit.

$\frac{1}{320}$ gallon lime juice ($\frac{1}{10}$ gill) with ¼ oz. sugar, on days when fresh vegetables are not issued. $\frac{1}{64}$ gallon rum (½ gill).	At the discretion of the G.O.C. on the recommendation of the Medical Officer.

Tobacco not exceeding 2 oz. per week for those who smoke.

Paragraph 30 provides that, at the discretion of the General Officer Commanding, ¼ lb. biscuit may at any time be substituted for ¼ lb. meat on days when preserved meat is issued; and when bacon and cheese are available, ¼ lb. bacon or 2 oz. cheese may be substituted for ¼ lb. meat.

Equivalents.

Paragraph 28 provides that when it may be necessary, or, in the opinion of the General Officer Commanding, expedient to depart from the scale given above, the following table of equivalents will be followed:—

Coffee	1 oz.	= ½ oz. tea.
Oatmeal	4 oz.	= 4 oz. bread or biscuit.
Biscuit	1 lb.	= 1¼ lb. bread.
Rice	1 lb.	= 1 lb. bread or biscuit.
Preserved meat	1 lb. (nominal)	= Ration of meat.
Chocolate	⅓ oz.	= ⅙ oz. tea.
Meat and vegetable ration		= Ration of meat (also vegetables in the field).
Pea soup (or Erbswurst)	2 oz. tin	= 3 oz. meat.
Porter	1 pint	= ½ gill spirits.
Preserved potatoes, uncooked	2 oz.	each = ½ lb. ordinary fresh vegetables.
Rice or peas	2 oz.	
Onions or leeks	¼ lb.	
Split peas	⅓ pt.	each = ¾ lb. flour.
Calavances	¾ pt.	
Dhal	¾ pt.	
Oatmeal	¼ pt.	

Australia.

MILITARY FORCES OF THE COMMONWEALTH.

At camps of training, bivouacs, staff rides, or active service within the Commonwealth, all officers, warrant and non-commissioned officers, soldiers, nurses, and civilian subordinates of the Commonwealth military forces, and officers' servants (not soldiers), at the rate of one per officer, will be allowed daily a ration as follows :—

1¼ lbs. bread or 1 lb. of biscuit.
1½ lbs. fresh meat or 1 lb. of preserved meat or salt fish.
¾ oz. coffee.
1/32 oz. pepper.
8 oz. mixed vegetables, or 2 oz. cheese, or ⅙ lb. jam.
1 lb. potatoes.
3 oz. sugar.
½ oz. salt.
¼ oz. tea.

Straw for Tents.

10 lbs. per officer or soldier, to be exchanged periodically, as required.

Candles.

1 per bell tent. 2 per marquee tent.

Hospital tents or marquee tents used as hospital tents as may be directed by the medical officer in charge.

India.

The following is given in the "Field Service Manual (India)" as the scale for British troops in India :—

1 lb. preserved meat, or 1¼ fresh meat.
(½ oz. vinegar with tinned meat).
1 lb. bread, or 1 lb. biscuits, or 1 lb. atta.
1 oz. tea.
2½ oz. sugar.
½ oz. salt.
1/36 oz. pepper.
1 lb. fresh vegetables, or 3 oz. preserved vegetables, with 1 oz. pickles or 4 oz. dhal.
2 oz. rice, 3 times a week.

In lieu of 1 lb. fresh meat :—

¾ lb. preserved meat, ⅛ oz. of vinegar.
3 oz. bacon twice a week.
3 oz. cheese twice a week.

After campaign has lasted one month in lieu of 4 ozs. bread twice weekly.

2 oz. oatmeal.
1½ oz. condensed milk.

Drawing and serving out Rations.

When drawing rations, a non-commissioned officer should first ask how much is to be drawn per man and should see that the rations are weighed whenever possible.

If the men are not receiving full rations, the non-commissioned officer, when serving out the rations, should tell the men what quantity each is to receive. Great care should, of course, be taken to see that each man receives his fair share.

Scale of Forage.

Allowance.

The full forage allowance per horse and per mule of 15 hands and upwards, doing heavy draught work, usually given on active service is :—Oats 15 lbs., compressed hay 12 lbs. Cobs under 15 hands get 12 lbs., and small mules 6 lbs. hay and 12 lbs. oats.

Equivalents.

Paragraph 163, " Allowances of the Army, 1910," gives the following scale of equivalents :—

Compressed forage	18 lbs., equivalent of 10 lbs. oats and 12 lbs. hay.
or	
Forage cake	20 lbs., equivalent of 12 lbs. oats and 12 lbs. hay.

Australia.

MILITARY FORCES OF THE COMMONWEALTH.

The following are the daily scales of forage for issue to horses :

	—	In quarters.	In camps.*
For horses the property of the Commonwealth Government, and for private horses of officers, warrant officers, and soldiers when attending schools of instruction and camps.	Oats lbs.	10	12
	Chaff ,,	8	12
	Hay ,,	6	..
	Bran ,,	1	1
	Straw ,, (weekly)	7	..

* Or in other circumstances which, in the opinion of the Commandant, are equivalent to being in camp.

India.

The following table is taken from the "Field Service Manual for India" as being the full forage allowance :—

	Oats, barley, or grain. lbs.	Hay. lbs.	Salt. oz.
Horses	8–10 ..	20 ..	1
M.I. ponies	6 ..	20 ..	⅔
Ordnance mules ..	6 ..	20 ..	⅔
1st class baggage mules	6 ..	15 ..	⅔
R.A. bullocks	7 ..	25 ..	⅔
Transport bullocks ..	6 ..	20 ..	⅔
Camels	6 ..	25 ..	1½
Pack bullocks ..	4 ..	14 ..	⅔
Donkeys	3–4 ..	10–13 ..	¼

For particulars as to quality of forage, see pp. 397, 398.

Scale of Fuel and Light.

Paragraph 247 "Allowances of the Army, 1910," provides that the maximum daily allowance of fuel for troops on active service is 2 lbs. of wood per head.

No fuel will, however, be carried nominally except the wood of the ration boxes, which will be issued for kindling purposes, and be supplemented by fuel obtained locally. 1 lb. coal is the equivalent of 2 lbs. wood.

Paragraph 248 provides that the daily allowance of light will be one gill of oil (with wick) or one candle for each lamp, or lantern, authorised.

One gill of oil is the equivalent of 6 oz. of candles.

Estimation of Quantities.

The following are approximately the weights of specific quantities of wood:—

40	cubic	feet of	English	oak and hard wood	generally	=	1 ton
50	,,	,,	,,	fir and pitchpine	,,	,,	,,
65	,,	,,	,,	sawn deal planks	,,	,,	,,
70	,,	,,	,,	firewood ends	,,	,,	,,
220	,,	,,	,,	broken packing cases and similar articles	,,	,,	,,

It is usually impossible on service to have every load of fuel weighed on delivery. The following rough method of estimating weight, which is given in A.S.C. Training, may be found useful:—

If the wood is delivered in 4-foot lengths, a good way of checking the quantity is to make rectangles 6 feet by 4 feet, and at each corner drive a stake into the ground, leaving 4½ feet above the ground. When the spaces enclosed by these stakes are built up with wood, each will be found to contain half a fathom or 108 cubic feet weighing about 1½ tons.

Wood may, of course, be estimated in a similar way when placed on a timber or farm wagon, but round unsawn logs in the country are sold by the cord of 128 cubic feet.

For English timber measurements converted to metric, see p. 880.

Coal.

25–26	cubic	feet	anthracite	averages	1 ton.
42	,,	,,	household coal	,,	,,
82	,,	,,	coke	,,	,,

CAMP COOKING.

Construction of Cooking Places.

Cooking for a Large Party.

When cooking for a large party the best method, if there is a good draught, is to place the camp kettles round the fire as shown in Plate 62, that is to say, three on either side of the fire, one at the leeward end, and three resting on the top of the lower tier. To increase the draught, a chimney of sods or other suitable material about 3 feet high can be built at the leeward end if a trench 6 to nine inches deep and about 9 inches broad is cut for the fire. The chimney must be wider at the bottom than at the top.

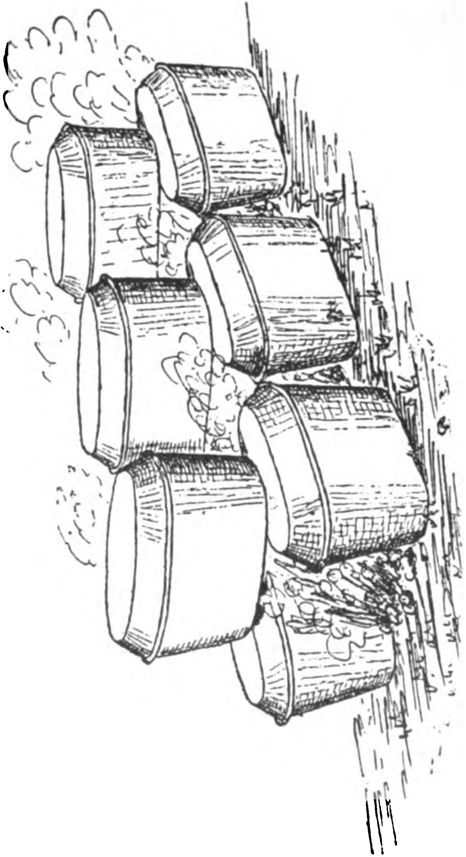
If there is not a good draught, the best way, as the flames will rise, is to place the camp kettles round the fire in the shape of a horsehoe. The camp kettles may be placed in about three tiers.

Cooking for a Small Party.

When mess tins are used, they can be placed as follows:—

Four mess tins should be placed on the ground in two rows, parallel to the direction of the wind, the rows about 4 inches apart. The end furthest from the wind should be closed by a fifth mess tin. Three mess tins should then be placed

PLATE 62.



FORM OF FIELD KITCHEN.

on the top of the original five and the fire lighted at the open end. In order to get the fire to draw well from the beginning, a good plan is to place two stones between the two canteens on either side of the fire, rest a piece of hoop iron or other non-inflammable material between those two stones and then place the sticks on that.

One man can attend to such a "kitchen" of eight mess tins; he should change the position of the tins from time to time, to ensure the contents being evenly cooked.

Only a small quantity of wood is required to keep up a draught.

Methods of dealing with Rations.

As regards the best method of dealing with rations, detailed instructions will be found in the circular recently sanctioned by the War Office. The following extracts from it may be found of use:—

(*a*) *When Fresh Meat only is used.*

Breakfast (stew); mid-day (bread and cheese); evening (steak).

The meat ration should be cut into portions corresponding to the number of squadrons, troops, or companies.

The company cooks should then remove the bones, and cut up the best portion into thin steaks, weighing 6 ozs. each. In hot weather the steaks should be partially cooked by frying in fat, and allowed to cool. The rest of the meat should be prepared for stew.

The steaks should be laid on two clean waterproof sheets, and the men should file past with their mess tins to receive the ration and condiments.

On arrival at camp the men can cook their own dinner either by adding water or by frying the steaks in fat.

If desired, the steak can be cooked for breakfast and the stew in the evening.

(*b*) *When Fresh and Preserved Meat is issued.*

Since it is desirable that the men should, if possible, have a hot meal at night, the preserved meat should be used for breakfast and midday, and the fresh meat for the evening meal. When, however, it is necessary for the men to have food in the evening without waiting, the preserved meat should be kept till then.

When both kinds of meat are carried in mess tins the fresh should be put at the bottom and pressed well down.

(*c*) *When Meat is required to be carried in Haversacks.*

There are two ways of preparing meat for carrying in haversacks:—

(1) Take one-third of the issue of meat, cut into joints and boil (for about 2½ hours) until it is tender.

Remove the liquor and allow the meat to cool. Then cut into thin slices.

(2) Take the best portions of the meat, cut into slices about 4 ozs. in weight, fry in fat, and while warm press them between slices of bread.

(*d*) *When Meat is to be carried in Mess Tins and subsequently cooked.*

Cut the meat into small cubes and dust with a mixture of flour, pepper, and salt before placing it in the mess tins. It will then keep for 15 hours.

To cook the meat, add just enough water to cover it, and cook for 1½ hour, stirring while cooking

The meat may also be collected from the tins and cooked in bulk by the cooks. This is preferable, as it leaves the men free for other duties.

Hints for Cooking in Mess Tins.

(*a*) A mess tin will cook one man's ration of meat with vegetables, or two men's without vegetables.

(*b*) Cook on small fire, as rapid boiling makes the meat tough.

(*c*) Grease the outside of the tin before using, so that it may afterwards be easily cleaned.

(*d*) Not more than 10 tins should be put on one fire.

Recipes.

Capacity of Camp Kettles.

The capacity of a camp kettle is as follows :—

Tea or coffee sufficient for 30 men.

Stew sufficient for 25 men.

Time required.

All the times mentioned below are calculated from the time when the meat is drawn, the water fetched, and the material ready for lighting the fire.

To cook Kabobs.

A meal can be quickly prepared by cutting the meat into pieces about the size of a penny but three to four times as thick. Skewer these on a piece of wire or hard wood and cook them before the fire for a few minutes.

With Fresh Beef or Mutton.

1. *Plain Stew.*

(In mess tin for one man or in camp kettles for 25 men.)

Time required :
For camp kettles
2 hours.
For mess tins
1½ hour.

Ingredients per man. 12 ozs. meat, one small carrot and onion, or failing that, compressed vegetables, one teaspoonful of flour, a pinch of salt and pepper, water as required.

Peel, scrape, and cut up vegetables and onions, separate meat from the bone, cutting it across the grain into pieces of 2 ozs. each in the case of camp kettles, or about the size of a penny in the case of mess tins ; mix the dry flour, salt and pepper well together, place a little stock or water in kettle, rub pieces of meat in dry flour and put into kettle with the vegetables and onions, barely covering it with stock or water; allow to simmer for 1½ hour, keeping the vessel closed till done.

2. *Irish Stew*.

Time required:
For camp kettles
2 hours.
For mess tins
1½ hour.

(In mess tin for one man or in camp kettles for 25 men).

Ingredients per man. 12 ozs. meat, potatoes 1 lb., one small onion, a pinch of pepper and salt, water as required.

Peel, wash, and slice the potatoes, peel, clean, and cut up the onions, cut the meat into small pieces and place a little stock or water in kettle, and a layer of potatoes at bottom, then a layer of meat and onions, seasoned with salt and pepper, and so on alternately until vessel is nearly full, the potatoes forming the top layer; barely cover top with stock or water; stew gently for 1½ hour, taking care it does not burn. The surplus fat must always be removed previous to cooking.

This stew is improved by the addition of dumplings, which are made as described in 8.

3. *Curry Stew*.

Time required:
For camp kettles
2 hours.
For mess tins
1½ hour.

(In mess tin for one man or in camp kettles for 25 men.)

Ingredients per man. 12 ozs. meat, one small carrot and onion, curry powder, a pinch of pepper and salt, water as required.

Mix the curry with the dry flour and proceed as for Irish stew.

4. *Sea Pie*.

Time required:
For camp kettles
2 hours.
For mess tins
1½ hour.

(One mess tin per man or in camp kettles for 25 men.)

Ingredients per man. 12 ozs. meat, 1 lb. potatoes, one small carrot and onion, three table-spoonfuls of flour, suet or dripping half ounce, pinch of baking powder, pepper, salt water as required.

Prepared ingredients as in case of stew and cover with paste, making hole in the centre. If there is sufficient paste, place half the ingredients at bottom of kettle, then a layer of paste, making hole in the centre, then the remainder of ingredients, covering the whole with a second layer of paste.

To make paste, mix flour and water, roll or beat it out with the hands on a flat surface, adding, if it is available, a little baking powder, say, a small tea-spoonful to 1 lb. flour. The paste should be about ¼ inch thick.

Preserved Meat.

5. *Stew.*

(One mess tin per man or in camp kettles for 25 men.)

Time required:
For camp kettles
1¼ hour.
For mess tins
40 minutes.

Ingredients per man. 12 ozs. meat, one small carrot and onion, or failing that, preserved vegetables, a pinch of salt and pepper, water as required.

Prepare as stew No. 1, adding jelly from the meat, and stew until vegetables are tender, then add meat and let the whole simmer for ten minutes and serve.

If preserved vegetables are used, they should be soaked and boiled for five minutes, and then put into the stew with the water in which they were boiled.

6. *Curried Stew.*

(One mess tin per man or in camp kettles for 25 men.)

Time required:
For camp kettles
1¼ hour.
For mess tins
40 minutes.

Ingredients per man. The same as for stew, with curry powder and flour added.

Prepare as for stew, mix the curry and flour with cold water into a smooth batter, and add it to the stewed vegetables and the meat; let the whole simmer for ten minutes and then serve.

If preserved vegetables are used, they must be boiled as stated above in 5.

7. *Sea Pie.*

(One mess tin per man or in camp kettles for 25 men.)

Time required:
For camp kettles 1½ hour.
For mess tins 1 hour.

Ingredients per man. The same as for stew, with flour and suet or dripping added.

Prepare as for stew, and when the vegetables are tender add to meat, covering the whole with a light paste and boil for 20 minutes. A thickening of flour added to the stew is an improvement.

8. *Salt Beef and Dumplings.*

(In camp kettles only.)

Time required:
For camp kettles 1½ hour.

Ingredients per man. 12 ozs. meat, 3 table-spoonfuls of flour, ½ oz. suet, water as required.

Soak and well wash the meat in cold water, and place in camp kettle with plenty of water and boil gently for one hour, then throw away the water and boil again in fresh water till the meat is cooked. Chop the suet up fine and mix with the flour, pour in some water and mix well, and form into dumplings about two inches in diameter; place the dumplings in the kettle with the beef about 30 minutes before the latter is cooked, and let both boil together until done.

9. *Stew with Australian Preserved Meat.*

(One mess tin per man or in camp kettles for 25 men.)

Time required:
For camp kettles 1 hour.
For mess tins 30 minutes.

Ingredients per man. 12 ozs. meat, 1 lb. potatoes, 1 small onion, pinch of pepper and salt, water as required.

After preparing the onions and potatoes as in No. 2, put them into camp kettle, season with pepper and salt, pour in sufficient water to cover them, stew gently, keeping the lid of the vessel closely shut, until potatoes are nearly cooked; then open the tins of meat, cut up contents and put them into the kettle with potatoes, letting the whole simmer for ten minutes, and then serve.

10. *Chupatties.*

Time required :
In mess tin lids,
25–35 minutes.

Ingredients. Flour, fat, and water.

Mix the flour with water, making it into a stiff dough; take a piece of dough and flatten it out with both hands until it is about a quarter inch or less thick and the right size to fit into the cover of a mess tin; melt the fat in the cover of a canteen, and when quite hot place the chupattie in it and leave it until it is quite brown on both sides. On an average fire it will take about thirty minutes to make 1 lb of flour into chupatties in a mess tin.

Another plan is for the cooks to make the dough and serve it out to the men to bake in their mess tins.

11. *Chickens.*

Time required :
For camp kettles
1 hour.

If chickens are at any time available they should be plucked and gutted. The easiest way of cooking them is to boil them for thirty minutes. When that has been done or when they are cold, the wings or legs may be cut off and fried for a short time in a mess tin lid in a little fat or dripping. They will taste somewhat better than if they are only boiled.

12. *Rice.*

Rice should be put into cold water and allowed to boil for twenty minutes.

13. *Suet Puddings.*

Time required :
For camp kettles
3½ hours, or for rolls 2 inches in diameter 2½ hours.

Ingredients : Flour, suet, and water, currants if available.

Mix the flour and water and add about ¼ lb. of suet to each 2 lbs. of flour. A little baking powder and currants if available will improve it. It should then be made up in long rolls of about four inches diameter and put into pudding cloths, after a little flour has been shaken over the cloth. Each cloth should be tied up at both ends before being put into the pot. If rolls of two inches diameter are made, they will take considerably less time to cook.

Substitutes for Suet, Dripping, and Baking Powder.

When suet or dripping is not procurable a little of the fat may be removed from the meat.

In the absence of baking powder a little extra dripping or fat may be used, or Eno's Fruit Salt.

14. *Tea.*

(In camp kettles for 30 men.)

Time required for camp kettles to boil, 30 minutes.

When the water is boiling put in 5 ozs. of tea for thirty men, let it stand for a short time and then serve.

15. *Coffee.*

(In camp kettles for 30 men.)

When the water is boiling put 7½ ozs. of coffee for thirty men, into the water, let it stand by the fire for fifteen minutes, then serve. A mess tin lid filled with coffee up to the level of the rim will give the required quantity for thirty men.

PART XIV.

FIELD ENGINEERING.

DEMOLITIONS.

Importance to Mounted Troops of having a Knowledge of Demolitions.

Mounted troops have, on numerous occasions in military history, been called on to undertake demolitions of railway bridges or other important structures, either on the enemy's lines of communication or at some important strategic point; and as they will, without doubt, in future wars be again detailed for this work, it is of importance that every mounted man, and particularly every Officer, should possess some knowledge of the subject.

As a very recent example, the daring cavalry raid made by Major Naganuma with some 150 Japanese cavalrymen, may be cited. Some seven weeks previous to the battle of Mukden, this force, moving only by night, rode some 360 miles in 43 days, and blew up a large railway bridge in rear of the Russians. Not only did this very seriously interrupt the Russian communications, but it served to draw a large body of Russian cavalry after them, thus weakening the Russian front during the Japanese great turning movement before that battle.

Explosives for use by Mounted Troops.

The two explosives most suitable for mounted troops to carry are guncotton and dynamite.

Guncotton.

Guncotton is made up either "wet" or "dry," and in the form of slabs and primers. Since dry guncotton can be detonated very much more readily than wet and is therefore not so safe to carry, guncotton in bulk is carried in the form of wet slabs. In order to detonate these slabs, dry guncotton, in the form of primers, must be carried.

Wet guncotton is made up in 1½ and 1¾ lb. slabs about six inches square, which can be easily and safely carried in a haversack or in wallets. Special slabs of 1 lb. each are made for cavalry pioneers. A horse falling on wet slabs would not make them explode, but a very heavy weight—at least, a dead weight, such as a rock—might do so. Apart from this, so long as they remain damp, slabs are absolutely safe and cannot be detonated even by a bullet passing through them. If any doubt is felt as to whether a slab is damp enough to render it absolutely safe, soak it in water for two minutes, and provided that it is not in an exceptionally dry or hot climate, the slab will then remain sufficiently damp for at least seven days.

Dynamite.

Dynamite is manufactured in the form of small grains, which vary in colour from buff to reddish brown. It is usually tied up in small cartridge shaped parchment bags containing 2 ozs. each.

Dynamite freezes at 40 deg. F., and, if once frozen, remains frozen at higher temperatures. Frozen dynamite can be distinguished from unfrozen by being harder, by being more brittle than plastic, and by being a slightly lighter colour. In this state it is very dangerous to handle.

Dynamite will certainly explode if a bullet strikes it, and would probably do so if a horse or a rock were to fall on it.

Relative Advantages and Disadvantages of Guncotton and Dynamite.

Dynamite is on the whole somewhat less powerful than guncotton. Speaking broadly, its effect is local, whereas that of guncotton is more extensive; that is to say, dynamite will create a greater and more shattering effect at the point of explosion, while the effect of a guncotton explosion will be extended over a wider area. For instance, dynamite is to be preferred to guncotton for blasting rocks, whereas guncotton is more effective for wrecking bridges.

The only material advantage of dynamite over guncotton is:

That being plastic, it is easier to fit into narrow and irregular holes, such as may be found, or made, in a rock.

Making up Guncotton Charges.

Means of Detonation.

A charge of wet guncotton "slabs" is detonated by the explosion of a dry "primer" in close contact with it. The "primer" is exploded by means of a "detonator," the "detonator" being detonated by means of either "safety" or "instantaneous" fuze, which is lighted by a match or other means.

Slabs.

As previously stated, slabs are the usual form in which wet guncotton is made up. In the opposite corners of each slab are bored two round holes, one of which is larger than the other.

Primer.

A primer is a circular disc of dry guncotton cut so as to fit into one of the holes in the slab. Primers are either 1 oz. or 2 ozs.; the small hole in the slab taking the 1 oz., the large hole the 2 oz. primer.

A primer should not be allowed to get wet, but if it is wet, it must be dried before use. It may be dried in the sun or at some distance from a fire, but great care must be taken that no sparks fall on it.

A bullet striking a primer will not detonate it unless previously heated, neither will a horse falling on it, but a heavy dead weight, on the other hand, might do so.

Detonator.

The detonator used is called "Detonator No. 8 for safety fuze," and is a small brass tube, painted red, about three inches long, shaped like a pencil with a tapering end. The tapering end contains fulminate of mercury, which is the detonating compound, above it being a wooden plug with a hole in it through which passes a piece of quick-match. The upper end of the tube is empty for the insertion of the "fuze," and is closed by a paper cap. Detonators are packed in lots of 25 in tin sealed cylinders painted red.

A detonator should only be carried in its proper cylinder. It should never be carried loose.

Safety Fuze No. 9.

Safety fuze is black in colour, has a column of fine gunpowder running down the centre, and is covered with flax, guttapercha, and waterproof tape. Its smooth surface enables it to be distinguished at night from Instantaneous Fuze. It will burn under water.

Safety fuze, when in good condition, burns at the rate of three to four feet per minute. Before using it, always cut off a small length to test the rate at which it will burn, because very old fuze has been known to burn almost instantaneously.

Safety fuze is not in any way dangerous to carry.

The fuze generally used is known as No. 9.

Instantaneous Fuze.

Instantaneous fuze is orange-coloured and consists of three strands of quick-match, enclosed in flax, with several layers of guttapercha and waterproof tape. It is covered with thin plaited string put on snake-wise, hence it can be distinguished in the dark from the safety fuze, which is perfectly smooth.

It burns at the rate of 30 yards a second. It is liable to jerk the detonator out of a charge by its violent jumps when lit unless it is carefully secured near the detonator.

Unless the safety of the firer or the depth of tamping requires it, instantaneous fuze should not be used in addition to safety fuze when there is only one charge, as it increases its liability to miss-fire. When firing charges with instantaneous fuze, a piece of safety fuze should be joined on for lighting to allow time for the firer to get away.

Joining Safety and Instantaneous Fuze.

These may be joined as follows :—

(1) Cut the instantaneous fuze on the slant so as to expose the quick-match for a short length ; treat the safety fuze in the same manner, taking care that the composition is laid well open. Join their surfaces together and bind up tight. A small piece of wood is useful as a splint, and a little powder or quick-match can be advantageously put between the fuzes at the joint.

(2) Cut a semi-circular nick in each fuze near the ends, exposing the core of each. Put the nicks together and bind up tight.

To join Two Lengths of Instantaneous Fuze.

Two lengths of instantaneous fuze can be joined by slitting the outer cover of each piece at the end, so that it can be turned back to expose the quick-match ; the strands are then twisted together, the outer covering made to overlap the joint and firmly fixed with twine.

Joints can be made watertight by wrapping them round with indiarubber tape smeared with indiarubber solution.

Junction Box.

A junction box is required only when two or more charges have to be exploded simultaneously.

It is a small box containing gunpowder, with three or more holes in it through which the safety fuze and the lengths of instantaneous fuze are inserted. If a junction box is not available, a small bag of gunpowder will answer the purpose, the safety and instantaneous fuze being inserted in the mouth of the bag, which is then tied up.

Portfire and Matches.

A portfire is a form of squib, which is easily lit and readily kept alight. If not available, matches can be used.

1. Making up Single Guncotton Charge.

The necessary steps to take to make up a single guncotton charge, as shown in Plate 63, p. 667, are as follows :—

1.—*Prepare Slab.*

If the charge is to consist of one slab of guncotton, no particular preparation is required, but if it is to be a smaller charge, it is necessary to cut a slab. The slab should, if possible, be cut so that the piece to be used includes the hole which is the right size for the particular primer.

If it is necessary to cut a slab which appears at all dry, never do so without first soaking it in water. If that is not possible, pour water on it. It should be cut with a sharp knife if there is not a proper saw handy. When cutting a slab place it, if possible, between two boards, cutting it while so pressed, to prevent it flaking away. If small pieces flake off during the process of cutting, they should be carefully gathered up, if in a tropical climate, and buried, because if any weight were to fall on them an explosion might occur.

If more than one slab is to be used for the charge, they should be lashed together on a board, as shown in Plate 70, p. 689, care being taken that each slab is in close contact with the next.

2.—*Insert Primer in Slab.*

Insert the primer into a hole of one of the slabs composing the charge, using whichever hole the primer fits. If the primer will not fit, it should be closely tied to the slab.

If a large charge is being made to blow up, say, a bridge or a stockade, it is better always to use two primers and fuzes, in case one of them fails. With a charge of 20 lbs. or under, one primer will be sufficient, unless in close proximity to the enemy, when two should invariably be used.

3.—*Cut Required Length of Safety Fuze.*

As previously stated, always cut off a piece of safety fuze and test the rate of burning. When in good condition it usually burns about four feet a minute. Allow a sufficient length to enable the man firing the charge to get well out of the way of any iron, stones, or earth which may be thrown up. The larger the charge the greater of course should be the length of fuze.

If a new coil is being used, cut off half an inch from the end of the fuze in case the powder has got wet or has been shaken out. In cutting the length of fuze required, take care to cut one end on a slant in order to expose as much of the powder as possible, cutting the other end straight across.

4.—*Insert Safety Fuze in Detonator.*

Before beginning to use a new cylinder of detonators always test one out of the box, so as to see that they have not deteriorated. This test is made by inserting, say, one foot of safety fuze in a detonator as subsequently explained, laying it on the ground and firing it. Directly the fuze is lighted, one should quickly withdraw some 20 yards away. If the detonator explodes loudly, it has not deteriorated to any material extent. If however it only fizzles, another box should be tried.

Cavalry pioneers are often served out with detonators with a short length of safety fuze already inserted in each detonator, the fuze having also a piece of quick-match attached to the end to facilitate lighting. When these are not available, insert the straight cut end of the fuze *very gently* into the thicker end of the detonator, from which the paper cap should have been torn. THE OTHER END OF THE DETONATOR, in which is the fulminate of mercury, IS ON NO ACCOUNT TO BE TOUCHED. THIS END SHOULD BE HELD AWAY FROM ONE WHEN INSERTING THE FUZE. The thicker end of the detonator is then slightly bent with one's fingers or with a pair of tweezers, so as to grip the fuze and prevent it being withdrawn.

5.—*Insert Detonator in Primer.*

Gently insert the small end of the detonator into the primer so as to fill the entire length of the hole in the primer. If the hole is too large, wrap a piece of grass or paper round the detonator. If it is too small, it must be enlarged with a rectifier—a wooden instrument usually supplied with each box of detonators—or a piece of wood. BUT THE HOLE IN THE PRIMER MUST NOT BE ENLARGED WITH THE DETONATOR OR ANY METAL INSTRUMENT. (See Plate 63, p. 667.)

6.—*Tamp*.

All charges should be tamped or covered with earth, or bags filled with earth, or stones, or any other convenient material, as this has the effect of confining the gases at the beginning of the explosion and thus developing their force more fully.

7.—*Cover up Charge*.

Care must be taken to prevent sparks from the fuze falling on the charge, and setting it alight instead of detonating it. For this reason the charge, if untamped, must be covered with grass or any other material.

FIRING A CHARGE.

The easiest way of firing a charge is with a portfire lighted with an ordinary match, and then applied to the safety fuze. If a portfire is not available, the fuze should be lighted by a fuzee match or from a pipe, as it is somewhat difficult to light from an ordinary match.

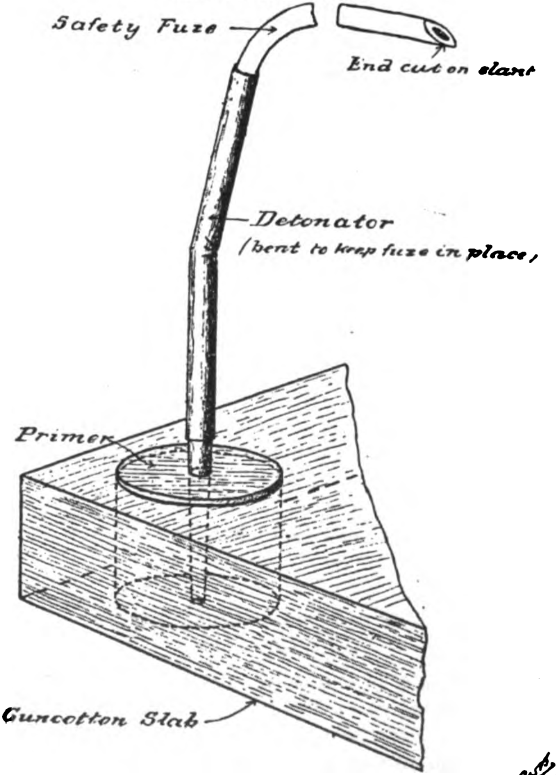
It is easily seen when the fuze is alight, because it begins to blow out and flare at the lighted end. Directly this occurs run—never less than 100 yards—and more than that, if bricks or stones are likely to be sent flying.

2. Making up two or more Charges to be Fired Simultaneously.

To fire two or more charges simultaneously, equal lengths of simultaneous fuze, united by a length of safety fuze, are required.

PLATE 63.

FUZE DETONATOR PRIMER AND GUNCOTTON SLAB
READY FOR FIRING


Safety Fuze
End cut on slant
Detonator
(bent to keep fuze in place)
Primer
Guncotton Slab

The following are the necessary steps to take in making up two or more charges to be fired simultaneously :—

1.—*Prepare Slabs.*

The necessary slabs for each of the charges will be prepared in the same way as in the case of those forming a single charge. See p. 664.

2.—*Insert Primers in Slabs.*

See 2 on p. 664.

3.—*Cut Required Lengths of Instantaneous Fuze.*

The instantaneous fuzes for each of the charges must be of the same length, so that the charges will explode at the same time, and must be sufficiently long to allow the loose ends of all of them to be tied together in the bag of gunpowder or fixed into the junction box. Cut the ends straight across.

4.—*Insert each Length of Instantaneous Fuze in a Detonator.*

Insert one end of each length of instantaneous fuze into a detonator in the same way as in the case of inserting safety fuze in a detonator. See 4 on p. 665.

5.—*Insert each Detonator in a Primer.*

See 5 on p. 665.

6.—*Insert Loose Ends of Instantaneous Fuze in Junction Box or Gunpowder Bag.*

If a junction box is available, insert each of the loose ends of the instantaneous fuzes into a separate hole in the box, each end being gently pressed in as far as it will go.

If no junction box is available, fill a small bag with gunpowder and put the loose ends into the bag.

7.—*Insert Length of Safety Fuze into Junction Box or Gunpowder Bag.*

Cut off a piece of safety fuze and test the rate of burning. Allow a sufficient length of fuze so that the man firing the charge can get well out of the way afterwards.

Cut the fuze with one end on the slant and the other straight across. Put the straight cut end into one of the holes of the junction box or bag. If a bag is used, it should be tied up tightly.

8.—*Cover up Guncotton and fix down Instantaneous Fuze.*

Care must be taken that no portion of the instantaneous fuze can come into contact with, or throw sparks on, the guncotton; therefore, when the charge is untamped, the guncotton should be covered with some grass or other handy material. The instantaneous fuze should be tied or weighted down when used, because the force developed by its ignition is liable to pull it out of the detonator.

9.—*Firing the Charges.*

See p. 666.

Another Method of Firing 2 Charges Simultaneously.

Another method of firing 2 charges simultaneously by means of safety and instantaneous fuze but without a junction box is:—

Cut a nick in the centre of the length of instantaneous fuze and at one end of the length of safety fuze, Plate 64, Fig. 1. Bare the cores of both without breaking either. Then lay the nick of the safety on that of the instantaneous fuze so as to form a halved joint with the 2 cores in close contact. Secure the joint firmly with string or spun yarn, Plate 64, Fig. 2.

The above arrangement will ensure the two charges being fired simultaneously, one at each end of the instantaneous fuze.

Making up Dynamite Charges.

To make up dynamite charges, the following materials are essential:—

PLATE 64.

Fig. 1.

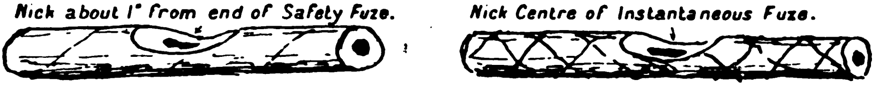
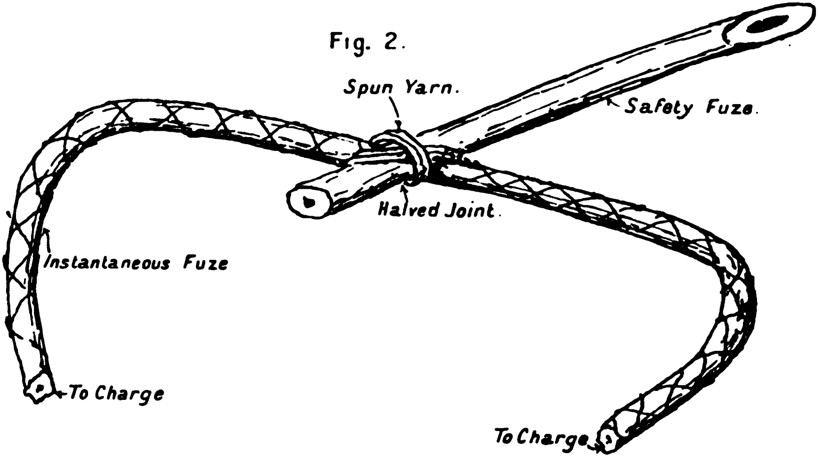

Nick about 1" from end of Safety Fuze.
Nick Centre of Instantaneous Fuze.

Fig. 2.


Spun Yarn.
Safety Fuze.
Halved Joint.
Instantaneous Fuze
To Charge
To Charge

Dynamite Cartridges.

As previously stated, dynamite is usually made up in 2 oz. cartridges.

Detonator.

A No. 8 Detonator, similar to that used with guncotton (see p. 661), or as is more usual a brass detonating cap, containing fulminate of mercury, can be employed.

Safety Fuze.

See p. 662.

Instantaneous Fuze.

See p. 662.

Portfire and Matches.

See p. 663.

Making up Single Dynamite Charges.

The following are the necessary steps to take in making up a single dynamite charge, as shown in Plate 65, p. 673.

1.—*If Dynamite is frozen, thaw it.*

If the dynamite has frozen, it must be thawed before it can be used. Frozen dynamite can be distinguished from unfrozen by being harder, by being more brittle than plastic and by being a slightly lighter colour.

DYNAMITE MUST NEVER BE PLACED NEAR A FIRE, but must be thawed by the warmth of warm water. Put the dynamite in a watertight tin, just as if melting glue, placing the tin in water no hotter than can be borne by the wrist, *i.e.*, about 130 deg. F. Leave it in the tin until it becomes plastic.

2.—*Put Charge into Borehole or other Crevice and ram it.*

When blasting a rock—for which purpose dynamite is generally used—if a borehole has been made or a crevice is to be utilised, put the dynamite in the place required, either in its bag or loose, as best suits the formation of the hole. In whatever form it is inserted, it should be very gently rammed with a WOODEN rammer. If more than one bag is used, each of the bags must be in contact with the one previously inserted, and accordingly each should be gently rammed in turn.

3.—*Cut Required Length of Safety Fuze.*

See 3 on p. 664.

4.—*Insert Safety Fuze in Detonator.*

See 4 on p. 665.

5.—*Insert Detonator in Dynamite.*

Gently insert a rectifier—a wooden instrument usually supplied with each box of detonators—or a small piece of wood about two inches into the dynamite, then very gently insert the detonator this distance in the hole and NO FURTHER. If the charge is in bags, insert the detonator into the last bag and tie the mouth up tightly. (See Plate 65.)

6.—*Firing the Charge.*

See p. 666.

Making up two or more Charges to be Fired Simultaneously.

The following are the necessary steps in order to make up two or more charges of dynamite to be fired simultaneously :—

1.—*If Dynamite is Frozen, thaw it.*

See 1 on p. 671.

2.—*Put Charges into Boreholes or Crevices and ram them.*

See 2 on p. 671.

3.—*Cut Required Lengths of Instantaneous Fuze.*

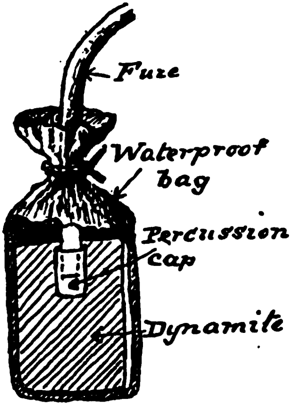
See 3 on p. 668.

4.—*Insert each Length of Instantaneous Fuze in a Detonator.*

See 4 on p. 668.

PLATE 65.

FUZE, DETONATOR AND DYNAMITE CARTRIDGE READY FOR FIRING


Fuze
Waterproof bag
Percussion cap
Dynamite

5.—*Insert Loose Ends of Instantaneous Fuze in Junction Box or Gunpowder Bag.*

See 6 on p. 668.

6.—*Insert Length of Safety Fuze in Junction Box or Gunpowder Bag.*

See 7 on p. 669.

7.—*Insert a Detonator into Each Charge of Dynamite.*

See 5 on p. 672.

8.—*Tamp Dynamite and fix down Instantaneous Fuze.*

See 6 on p. 666, and 8 on p. 669.

9.—*Fire the Charge.*

See pp. 666, 669.

Miss-fires with any Charge.

Common Cause of Miss-fire.

(*a*) Neglect of testing both the fuze and the detonator from each tin.
(*b*) The dampness of primers.
(*c*) Charge catching fire.
(*d*) Primer not being well fixed in slab. Note.—Always ensure tight contact between the primer and the slab.
(*e*) Detonator not having been well pressed into primer; if, for instance, only the tip of the detonator has been put in, the primer will not explode.
(*f*) Fuze not having been pushed well home in detonator.
(*g*) Fuze having been cut by a sharp stone or in some other way during careless tamping.
(*h*) Detonator having been pulled out of primer during tamping.

Precautions when Miss-fire has occurred.

If a miss-fire should occur and a charge does not explode, the longest possible time must be allowed to elapse before the charge is even approached. As a general rule, at least 20 minutes should be allowed from the time of lighting the fuze. WHEN A MISS-FIRE OCCURS THE CHARGE SHOULD ONLY BE WITHDRAWN OR TOUCHED WHEN IT IS ABSOLUTELY NECESSARY, because the removal of the tamping often causes any smouldering fuze to start burning again and an explosion to take place. A miss-fire, where not in an inaccessible place, can best be "killed" by placing and detonating a fresh charge close to the first. This is safer than attempting to meddle with it.

Hand Grenades.

Hand grenades were used to a large extent during the late Russo-Japanese war, especially by the opposing troops when they came to close quarters during the assaults on the various forts at Port Arthur. On another occasion a Russian guard of 17 men were killed by a fused slab of guncotton being thrown through one of the windows of a guard hut.

As the name implies, hand grenades are small shells made with the intention of being thrown by hand. The Hand Grenade (Mark I.) is fully described in Musketry Regulations, Part I., 1909, but they can also be improvised. The Japanese made them in the form of a small tin cylinder, about eight inches long and three inches in diameter, filled with a high explosive, and with about seven inches of safety fuze projecting through a hole in the lid; this fuze being lighted before the grenade was thrown; but any small tin would serve the purpose, guncotton or dynamite being placed inside and a detonator and fuze attached in the usual way. The fuze should not be longer than seven inches, or else the enemy might have time to throw it back before it exploded.

Table of Charges of Guncotton.

If the charge is tamped (see p. 666), the respective charges shown in the table on p. 676 can be decreased by one half.

If the demolition is to be carried out in proximity to the enemy, the charge should be increased by 50 per cent. in order to make absolutely certain of success.

Explanation of Formulæ used in Table below.

B = Length *in feet* to be demolished.
T = Thickness *in feet* to be demolished.
t = Thickness *in inches* to be demolished.

Object attacked.	Amount required in pounds.	Remarks.
Brick or Masonry Arch, haunch or crown	$\frac{3}{4}$ B.T.^{2}	Charges continuous across bridge. See pp. 688–695.
Brick wall, up to 2 ft. thick	2 per foot.	Length of charge not to be less than height of wall.
Brick wall, over 2 ft. thick	$\frac{1}{2}$ B.T.^{2}	
Brick Pier	$\frac{2}{3}$ B.T.^{2}	See p. 695.
Hard wood, stockade	3 B.T.^{2}	See p. 703. Soft wood halve this.
Hard wood, tree necklace	3 T.^{2}	See p. 706. Trees up to 12 inches in diameter.
Hardwood, auger hole	$\frac{3}{8}$ T.^{2}	See p. 707.
Stockade of earth between timber up to 3 ft. 6 ins. thick	4 per foot.	Continuous charge.
Fort gate	50	See p. 704.
Breech-loading guns	..	For 3 in. (field) guns use 2 lbs. Double charge for every inch increase in calibre. See p. 707.
Heavy rail	..	One-third of a 1$\frac{3}{4}$-lbs. slab against the web near a chair. See pp. 680, 681.
Iron or steel plate	$\frac{3}{2}$ B.t.^{2}	t. is in inches. See pp. 686, 688.
Iron or steel girder	$\frac{3}{2}$ B.t.^{2}	As for Iron Plate, thickness of flange to be measured where it joins the web. See pp. 686, 688.
Wire cable	$\frac{C.^2}{24}$	C being circumference in inches. See pp. 695, 697.
Frontier tower, stone and mud	16 to 30	In one charge in centre of tower.

Examples:—

(1) Suppose that a masonry arch of the following dimensions has to be destroyed:—

Width of bridge—20 feet.

Thickness of rail or road level to crown—4 feet.

This squared (that is, multiplied by itself; which the ^{2} means), is 16.

The formula in the table is $\frac{3}{4}$ B.T^2.

The calculation to arrive at the amount of guncotton required is therefore:—

$$\frac{3 \times 20 \times 16}{4} = \frac{960}{4} = 240.$$

That is, 240 lbs. of guncotton are required for the charge.

(2) Method of computing the charge of guncotton required to demolish a steel plate girder.

The general formula is:—

$$\text{Charge in lbs.} = \tfrac{3}{2}\ \text{B. t}^2.$$

A plate girder may be regarded as being made up of plates of various dimensions. These are, *vide* Plate 66 (p. 679):

(*a*) Flanges top and bottom, including a portion of the angle irons.

(*b*) Web top and bottom, including remainder of the angle irons.

(*c*) Remainder of web, *i.e.* central portion not covered by angle irons.

In the case of (*a*) and (*b*) the thickness includes the depth of rivet heads on one side in addition.

The charge for each of these plates is calculated separately from the formula, and the charge for the whole girder is the sum of the charges for the three parts.

Thus, suppose:—

(*a*)	has a	breadth of	1 foot	and a	thickness of	1½ inches.
(*b*)	,,	,,	3 inches	,,	,,	2 ,,
(*c*)	,,	,,	3 feet	,,	,,	1 ,,

We have :—

Charge to demolish (*a*) $= 2 (\frac{3}{2} \times 1 \times (\frac{3}{2})^2 = 6\frac{3}{4}$ lbs.

" " (*b*) $= \frac{3}{2} \times \frac{1}{4} \times 2^2 = 1\frac{1}{2}$ lbs.

" " (*c*) $= \frac{3}{2} \times 3 \times 1^2 = 4\frac{1}{2}$ lbs.

Consequently the total charge required will be $12\frac{3}{4}$ lbs., or, say, 14 to 15 oz. slabs of guncotton.

(3) For hasty demolitions where there is not time to measure the section of the girder, sufficiently accurate results are given by the formula :—

$$C = \frac{L^2}{15 \times D}.$$

Where C = charge of guncotton in 15 oz. slabs, including the allowance of 50 per cent. on active service.

L = length of girder in feet.

D = total depth of girder in feet.

Method of Fixing Charge.

The total charge should be divided into 2 half-charges, wedged firmly into alternate angles formed by the web and flange and fired simultaneously.

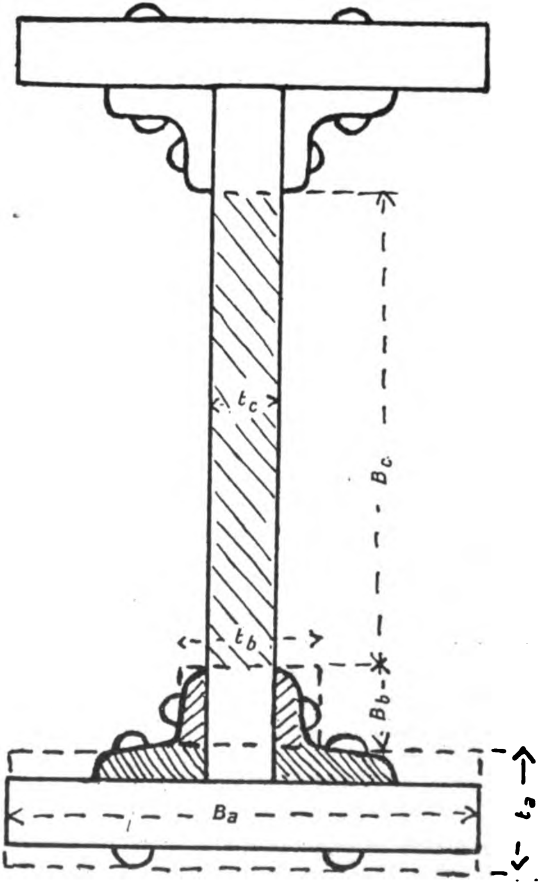
Tables of Charges of Dynamite.

The formulæ for guncotton given in table above, apply equally to dynamite, as the strengths of guncotton and dynamite are for all practical purposes the same. The fact of the charges given in the table being always increased by 50 per cent. when in the face of the enemy more than compensates for any loss of strength due to the use of dynamite.

DEMOLITION OF RAILWAYS.

The demolition of a railway should never be undertaken except on the express instructions of an officer. To carry it out the following, if obtainable, should be taken, even if it is some considerable distance to the railway :—

PLATE 66.


t_c
B_c
t_b
B_b
B_a
t_a

(1) Guncotton—the amount to depend on the work in view;
(2) Safety and instantaneous fuzes, primers, detonators, junction boxes or small bags of gunpowder;
(3) Sledge hammer or some similar tool;
(4) Strong adjustable spanner;
(5) Strong cord and string or wire for fastening explosives.

Two Alternatives.

Demolitions carried out by mounted troops are usually only undertaken in a hasty manner, therefore, in the absence of explicit instructions, it will lie with the commander of the party carrying out the work to choose between two alternatives:—(1) To effect the maximum of damage in a short time; or (2) to do a small amount of damage, which will not be readily visible except to some one carefully patrolling the line, but which will wreck the next train, and possibly cause loss of life as well as damage to the permanent way. No definite rules can be laid down as to which of these alternatives he should choose, seeing that the choice must depend entirely on whether his object is to wreck one particular train, or, on the other hand, to stop the through traffic on the railway for some considerable time. It is needless to point out that on certain occasions it will be possible as well as expedient to adopt both of these alternatives.

Methods of Demolition.

Leaving bridges and culverts out of the question for the moment, the rails and permanent way may be injured or partially destroyed in one of the following ways. All demolitions should, if possible, be carried out at curves, and preferably just close to bridges.

WITH EXPLOSIVES.

Cutting the Rails.

Cut from a slab of guncotton the requisite amount for an iron rail, *i.e.* ⅔ lb. This amount is most conveniently obtained by cutting a 1¾ lb. slab into three portions, because a third of a 1¾ lb. slab just fits an ordinary rail. Place the charge in the web of one of the rails, as shown in Plate 67, fastening it with string or wire to the rails so that the charge lies close to the web. In the case of rails which are fixed in chairs, it should be on the same side as the wooden keys, and close to the chair. Then fire it and the rail will be torn in half. For position to place charge at crossings, etc., see Plate 68, p. 683.

WITHOUT EXPLOSIVES.

The following are the methods of destruction without using explosives:—

1.—*Undo Bolts of Fish Plates.*

Undo the bolts of fish plates with a spanner at either end of the rail; knock out the wooden keys of the rail, thus allowing the rail to lie loose in the chairs. Do this to both rails, and if not noticed by the enemy the effect of it will be to throw any train off the lines. If a spanner is not available, the nuts on the bolts of the fish plates can usually be broken off by hammering, when the bolts can easily be knocked out. Should a length of rail be taken out and carried away—particularly at a curve or where there is a switch—it will at least create a delay, though it may not effect the wreck of a train, inasmuch as it would almost certainly be noticed.

2.—*Break off Outer Lip of Chair.*

When a line is laid with double-headed rails in cast-iron chairs, if a sledge-hammer or other similar implement is available, damage is very quickly effected by knocking out the oak keys and breaking off the outer lip of the chair with a side blow of the sledge-hammer. The fish-plate bolts should be left untouched. Experiments on a first-class permanent way show that four men, each using a sledge-hammer, can destroy nearly one mile an hour in this way.

PLATE 67.

CHARGE LASHED TO STEEL RAIL

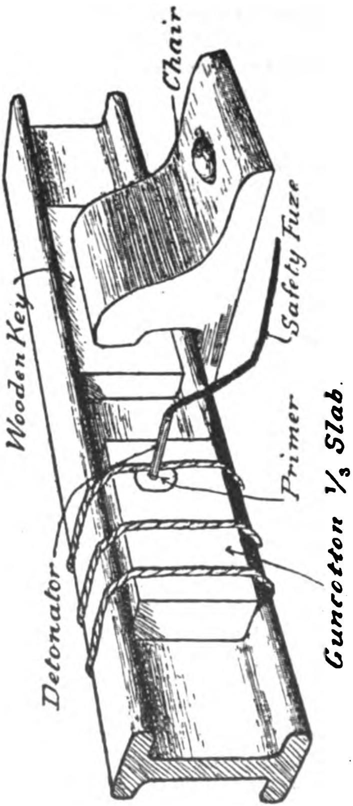
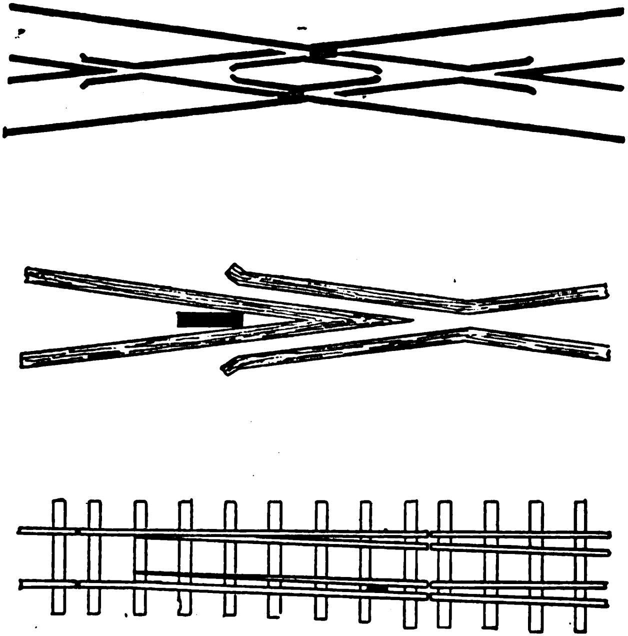

Chair
Safety Fuze
Wooden Key
Primer
Guncotton 1/3 Slab
Detonator

PLATE 68.

POSITION FOR GUNCOTTON CHARGES AT RAILWAY POINTS.



3.—*Lever up Outer Rail on a Curve.*

If a lever is obtainable, it should be placed under the *outer* rail on a curve, a flat stone being placed under the lever, so as to elevate the rail as much as possible, the line being then levered up and stones placed under the sleepers. Four men will be required for this work. To make sure of throwing a train off the metals, the rail must be raised at least four or five inches. The beginning of a sharp curve is the spot where a train would be most susceptible to any dislocation of the permanent way.

4.—*Insert Wedges between Junctions of Rails.*

In hot countries some damage may be done before the heat of the day by inserting nails, spikes, or other metal wedges between the junctions of the rails. This should be done at both ends of the particular rails which it is desired to damage.

5.—*Uprooting Whole Lengths of Rails.*

Another method, which was much used in the American Civil War, is to knock out the keys and unbolt the fish plates at the ends of a length of line—the length to depend on the number of men available, allowing, say, eight men for each single rail. The men should then range along the outside rail and on a signal bend down, catching the rail underneath, lift the whole rail with the sleepers and throw it right over, preferably down an embankment. The ballast must, of course, be first removed. Where there is a double line, a portion of one line of rails must be entirely removed and the other partially removed, or else material may be taken from one line of rails to repair the other. In this case it is also obvious that sharp curves are the best portions to select for demolition.

6.—*Burning Sleepers and Bending Rails.*

It will, of course, add very much to the damage done if large bonfires are made of any sleepers which have been torn up. The centre of the rails can then be heated in the fires and struck against trees, twisting them at the same time in order to bend them so that they cannot be used as rails again.

DEMOLITION OF TUNNELS.

A tunnel on a line should not, of course, be destroyed except on the orders of a staff officer.

It is seldom worth while taking steps to demolish a tunnel unless the earth immediately over the tunnel is of a soft and sandy nature, so that on the roof of the tunnel being demolished the earth will pour through, and so block the tunnel with an amount of material which will take a long time to remove. If it is to be done, it should be carried out in the same way as the demolition of the crown of an arch described on pp. 688–694.

DEMOLITION OF BRIDGES.

The demolition of bridges should not be undertaken except on the instructions of an officer.

The same explosives and demolition tools should be carried as for the demolition of a railway (see pp. 678, 680).

Three Forms of Bridges.

All bridges wholly or partly constructed of iron, steel, stone, brickwork, or masonry are either :—

(1) Arched ;
(2) Suspension ; or
(3) Girder.

Taking these in the order named, the following are the best methods of demolishing or damaging them.

Arched Bridges.

Iron or Steel.

In iron arch bridges at least two charges should always be used, the object in view being to blow away a segment of the arch, thus allowing the centre of the bridge to fall out without jambing. Before deciding on the position where the charges are to be placed, one must consider whether the segment of the bridge when cut through will at once drop out. The rent to be made should not be quite perpendicular, but should incline at the top a considerable extent inwards, as shown in Plate 69.

The arch of all iron or steel arched bridges is formed of two main girders usually one on either side of the bridge, subsidiary girders being fixed across the main girders. These main girders are the principal supports of the arch, and are the only supports which need be demolished.

Laying Charge so as to Cut Through Girders.

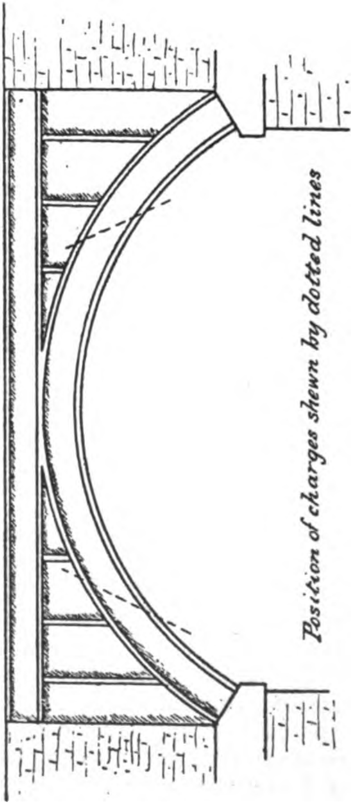
As to the method of laying the charge to cut the particular iron or steel girder which is to be demolished, there are so many different forms of girders in use that it is impossible to lay down rules for their destruction which would apply to all. It is therefore necessary to exercise one's own judgment in every case. But the chief points to bear in mind are that nearly all girders consist of top and bottom "flanges" connected by a web, the web consisting of continuous plates, shown in Plate 70, or of open cross bracing, as shown in Plate 71, of which there are many different types in use. Although the flanges are the essential parts of the girder, yet to ensure complete demolition both flanges and web should be cut through, unless the web is very thin as compared with the flanges.

For calculation of charge, see p. 676. The total charge should be divided into two half charges, wedged firmly into alternate angles formed by wedge and flange and fired simultaneously (Plate 70). The charge for girders of other patterns may be arrived at in a manner similar to the above. Care must always be taken to make sure that the charge extends along the whole length of material to be cut and is at every point in contact with it.

When there is not enough explosive for a complete

PLATE 69.

IRON ARCH GIRDER


Position of charges shewn by dotted lines

demolition, the two flanges only should be cut. If there is not enough for the two flanges, the bottom flange and the whole of the web in one panel should be cut. Failing this, cut the lower flange only.

Cutting of Flange and Web should be Simultaneous.

If the web is to be attacked, the cutting of the two flanges and the web should be carried out simultaneously, and should therefore be fired with instantaneous fuze in the manner before stated. See also Plates 70 and 71.

Stone, Brick, and Masonry.

In stone, brick, or masonry bridges the crown of the arch is the place to select for attack, unless there are two arches and unless the pier can be demolished with a smaller charge. When once the crown has been blown out, the remainder of the arch will either fall or will, at any rate, involve the enemy in an expenditure of considerable time and materials to repair.

Should there be time and a sufficiency of explosives, a greater effect even than the demolition of the crown will be created by the destruction of both haunches, though such a demolition will, of course, require two charges, both of which will be considerably larger than that required for the crown. The charges for the two haunches need not necessarily be fired together, but if the firing is not done simultaneously, the second charge should not be placed in position until the first has been fired.

If it is decided to attack the haunches, excavations can be made if time permits, and the charges laid and fired in the same manner as mentioned below in the case of the demolition of the crown.

Two Ways of Laying Charge to Destroy Crown.

There are two ways of laying the charge, one of which is to dig a trench from the road or rail level down towards the masonry of the crown of the arch, the other to place the charge on a board and hang it under the crown. The course to adopt

PLATE 70.

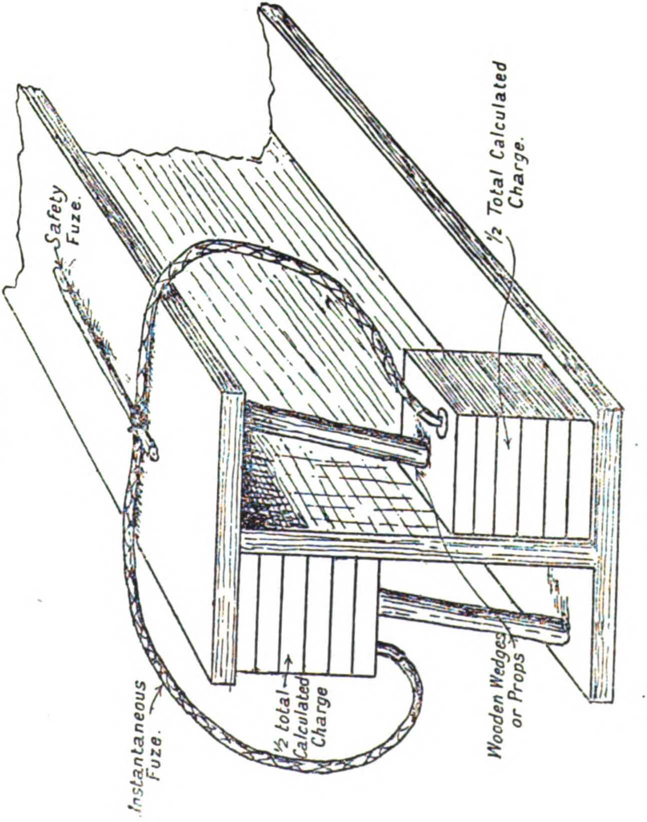
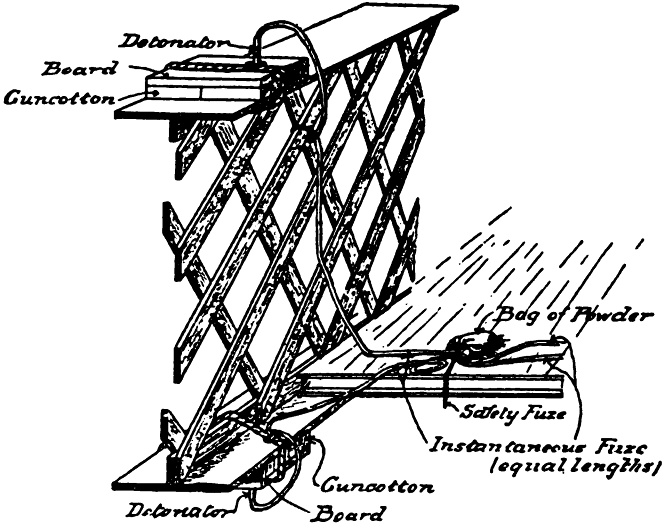

Safety Fuze.
½ Total Calculated Charge.
Instantaneous Fuze.
½ total Calculated Charge
Wooden Wedges or Props

PLATE 71.

GIRDER WITH OPEN WEB


Detonator
Board
Guncotton
Bag of Powder
Safety Fuze
Instantaneous Fuze (equal lengths)
Guncotton
Detonator
Board

must depend on the amount of explosives in hand and the time available. Should there be sufficient explosives and if time is short, it will be best to attach the charge to a board and hang it under the crown, but if there are not sufficient explosives for that operation or should there be time to excavate, the trench should be dug.

1.—*Excavating so as to lay Charge above Crown.*

If the first method is chosen, and a trench is dug down from the road or rail level towards the crown, an excavation must be made the whole width of the bridge, for the reason that the charge must extend right across the roadway from one side of the bridge to the other. A trench sufficiently wide to take a narrow board, on which the charge will be lashed, should then be dug to such depth as time allows, down to the arch ring, if possible. But it must be remembered that every six inches in depth makes a very considerable difference in the amount of explosives required. For instance, taking the width of the bridge from one side to the other to be 20 feet, and the thickness from the bottom of the trench dug to the arch ring to be two feet, the formula for brick or masonry being $\frac{3}{4} B T^2$, the calculation is :—

$$\frac{3 \times 20 \times 4}{4} = \frac{240}{4} = 60 \text{ lbs.}$$

but as it can be tamped, it may be halved, *i.e.* 30 lbs.

But if from the bottom of the trench to the arch ring is only one foot six inches, the calculation becomes :—

$$\frac{3 \times 20 \times 2\frac{1}{4}}{4} = 33\frac{3}{4} \text{ lbs., or if tamped, say, 17 lbs.}$$

When the trench has been dug to the required depth, the charge should be lashed to a board and laid at the bottom of the trench, or, if no board is obtainable, on the ground itself, great care being taken that each slab is in actual contact with the next. As each 1 lb. slab is, roughly, six inches long, it would take 40 slabs to extend across 20 feet, hence it would be necessary to cut some or all of the slabs in half, or even in three portions. Should there be sufficient explosives in hand, it will be best not to cut any slabs into smaller portions than halves. It is advisable for an extended charge, as in this case, to use two primers, two detonators, and two fuzes. The fuzes should be brought out at one end of the trench, care being taken that they are not damaged by the earth or other material which is laid on the top of the charge for tamping.

2.—*Suspending Charge below Crown.*

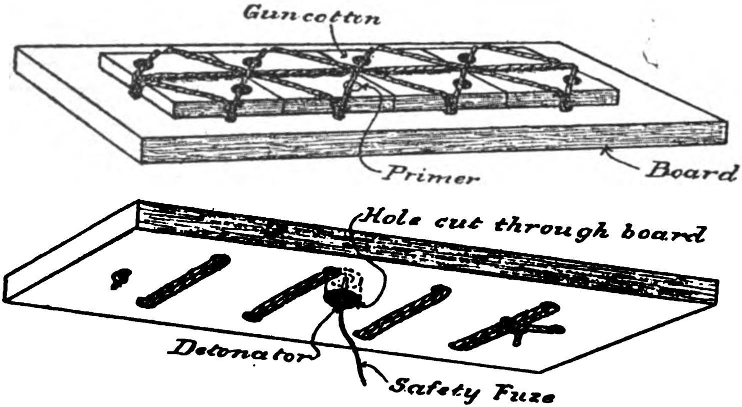
If the second method is chosen, namely, to suspend the charge below the crown, the charge should be lashed on to a board, as shown in Plate 72. The board should then be closely tied up under the crown, as shown in Plate 73. Great care must be taken that the charge itself is in actual contact with the crown from one side of the bridge to the other, and that the board does not sag in the centre. If it tends to sag, tie another board underneath it in order to stiffen it, or place something between the centre slabs and the board to counteract the sagging.

In the case of a bridge over water, if no other means can be found of getting the board fixed into position, the slabs may be lashed on to the board, and the board, with a rope attached to each end, lowered into the water below. One rope can then be dropped, and the board allowed to drift through the bridge, a man catching the loose rope and bringing it up on to the bridge, so that the board may be hauled up, and the primer, detonator, and fuze attached. The rope can be caught either by a man swimming out or being lowered over by a rope. If the latter, the best plan for him is to put a stick through a knot in the end of the rope and sit astride of that. When the primer, detonator, and fuze have been attached, the board can be lashed in position, and the charge fired.

PLATE 72.

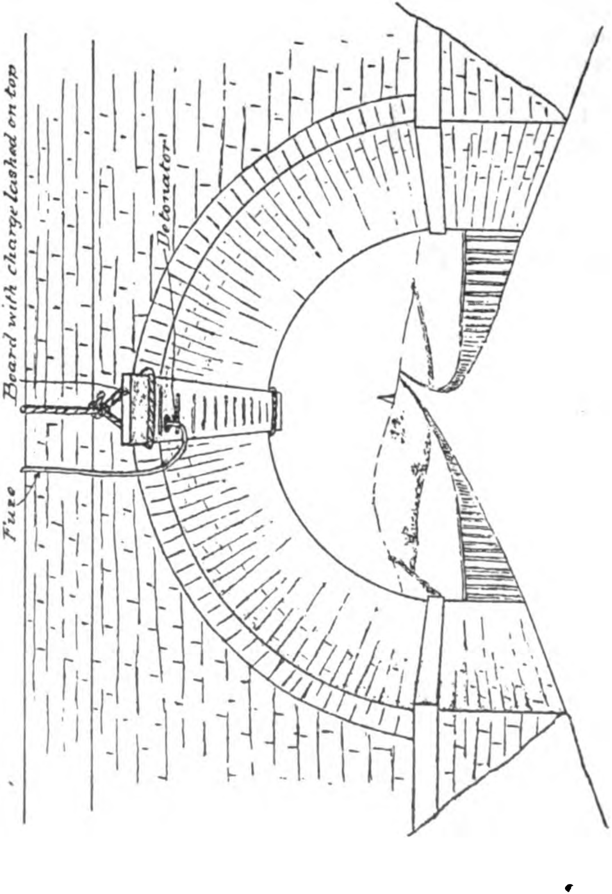
CHARGE LASHED ON BOARD

View of Top


Guncotton
Primer
Board
Hole cut through board
Detonator
Safety Fuze

View underneath

PLATE 73.


Board with charge lashed on top
Detonator
Fuze

Demolition of Pier.

If there are two or more arches to a bridge, and if it is possible for the pier or piers between the arches to be demolished with a less charge than would be required for the crown, the pier should be chosen. To ascertain the charges required for the crown and the pier, for the purpose of comparison, take the respective measurements and calculate, from the formulæ given on pp. 676–678, the two amounts.

If it is decided to demolish a pier, it is better to cut grooves in the brickwork or masonry, if time permits, because, besides slightly reducing the amount of explosives required, it acts to a small extent as tamping would.

The charge should be lashed to a board and the board to the pier in the manner shown in Plate 74 (p. 696).

Suspension Bridges.

In demolishing suspension bridges, both of the cables should be cut. Each cable should be cut at least in one place, and, if possible, in two. Where the piers are light, the shore end of the cables may be cut, in which case the weight of the cables may pull the piers over, but this is not certain to happen in the case of large suspension bridges with massive piers. In these cases the cables are usually made up of links, which should be cut in the centre of the bridge at the point where they are thinnest. The effect of cutting the cables of large suspension bridges will at least be to prevent any traffic passing over them, even if it does not cause the centre of the bridge to fall.

The charge should be attached to the cables in the manner shown in Plate 75. The cable need not necessarily be destroyed on both sides of the bridge simultaneously.

Girder Bridges.

Cast Iron or Steel.

All girder bridges have at least two main girders, which carry the cross girders and roadway. These main girders can

PLATE 74.

CHARGE LASHED TO BRICK PIER

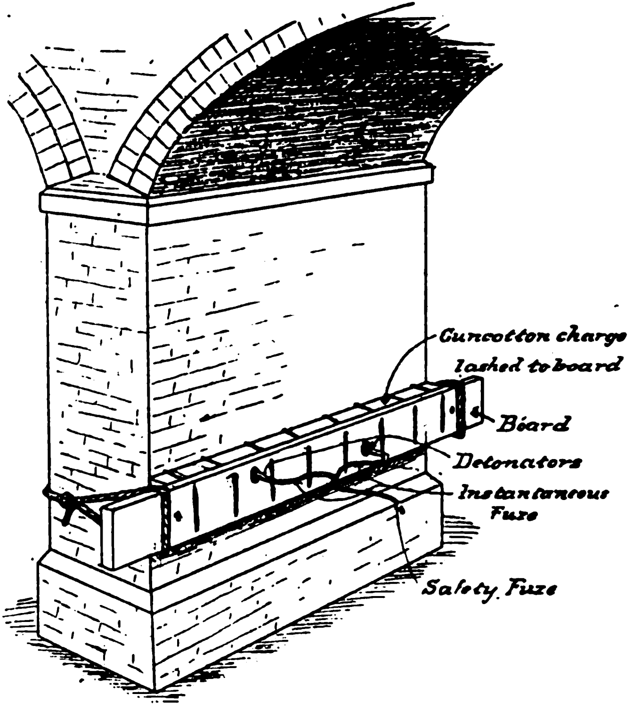
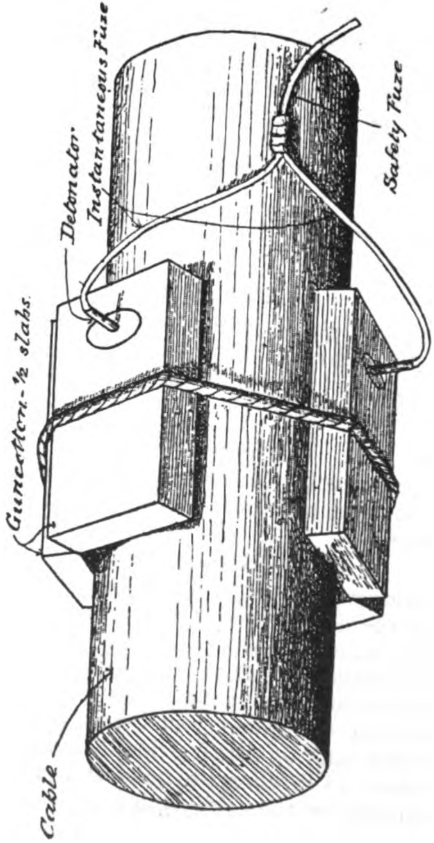

Guncotton charge lashed to board
Board
Detonators
Instantaneous Fuze
Safety Fuze

PLATE 75.


Safety Fuze
Instantaneous Fuze
Detonator
Guncotton-½ slabs.
Cable

CABLE OF SUSPENSION BRIDGE

usually be quickly distinguished, as they carry the flooring and go right across the span. It will be necessary to demolish the main girders only. They should be cut near the point of support, and, if possible, at each end of a span, the longest span being chosen. (See Plate 76.) The two girders at one end of the span should be cut simultaneously, but not necessarily at the same time as the girders at the other end. In the case of a girder running over several spans, the point selected should be either the first or last span at the end away from the shore.

Method of cutting Iron or Steel Girders.

See pp. 685–688.

Wrought Iron.

Wrought iron girder bridges may be damaged, and even destroyed, by means of large fires of sleepers, etc., lighted against the girders, which, if made red hot, will sink by the pressure of their own weight.

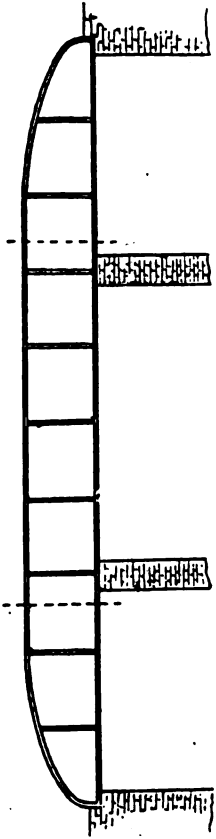
Wooden Bridges.

If it is not possible to burn wooden bridges, they can best be destroyed by guncotton slabs being attached to one of the main supports.

Bridges of Boats.

Long bridges of boats, such as were used on the Orange River after the destruction of the railway bridge, can best be destroyed, if time is short, by cutting one of the main cables with a ½-lb. charge of guncotton lashed to it. In addition, some of the boats should have small holes knocked in them, or the plugs should be withdrawn just before the cables are cut, so that they may sink on drifting down stream. If iron or steel boats are used, a ½-lb. charge of guncotton, fired simultaneously with the charge on the cable, will blow a hole in the bottom of any boat.

PLATE 76.



RAILWAY GIRDER BRIDGE

Best points to cut girder shewn by dotted lines.

DEMOLITION OF TELEGRAPH LINES.

No telegraph line should be damaged without special orders.

Material for Demolition.

If ordered to demolish or damage a telegraph line, the following should be carried :—

(1) Wire-cutter ;
(2) 3 to 4 yards of copper wire ;
(3) Spade.

Two Ways of damaging Telegraph Lines.

There are two ways of damaging telegraph lines :—

(1) By the creation of faults ; and
(2) By cutting the wires.

The creation of faults on a line will probably cause as much delay as the destruction of the line, and has the added advantage of being more easily effected and less readily detected.

There are three different kinds of faults, viz. :—(*a*) disconnections, (*b*) leaks, and (*c*) contacts.

(*a*) Disconnections are caused by partial or complete breaks in the continuity of the conductor (*i.e.* the wire).
(*b*) Leaks are caused by connecting the conductors with the earth.
(*c*) Contacts are caused by two wires touching one another or by being joined with copper wire.

Methods of creating Faults.

The following are three methods of creating faults :—

1.—*Replace Wire by Whip-cord.*

Cut a wire and replace it by a stout piece of whip-cord. This forms a disconnection. It is best effected by climbing one of the poles, taking a strong piece of whip-cord, putting a clove hitch round the wire and another clove hitch round the wire on the other side of the pole, then cutting with the wire-cutter the wire between the two clove hitches. The whip-cord can then be tied on to the insulator.

2.—*Replace Wire with Non-Copper Wire.*

Cut out a portion of the wire in the manner above described and replace it by a piece of non-copper wire of low conducting power and of approximately the same gauge, so that it may not be readily detected by the eye. This will form at all events a partial disconnection. It is better to make use of whip-cord while attaching the non-copper wire.

3.—*Form Contact between Wires.*

If there are two or more wires, form a contact between them by connecting a piece of copper wire with each of the wires. This is done by wrapping the copper wire round each of the wires twice. In order to form a leak, in addition, carry the copper wire down the pole into the earth, preferably into a wet place. Although other wire will create a certain amount of fault, copper wire is the only wire which satisfactorily creates a complete fault. If the operation is carried out as above stated, practically no messages can be passed through any of the wires.

Cutting down Portions of the Line.

The other method of damaging a line is by cutting or blowing down the poles, and then cutting away any wires that remain, or by climbing the pole and cutting the wires with a wire-cutter. The wires are best cut close to the pole, care being taken that no one is standing near when they are cut, as they coil up very quickly and with great force.

Even where faults have already been made it is still desirable to cut down portions of the line in addition because the faults may escape detection at first, and a second examination of the line by the restoring party may be rendered necessary.

Subterranean Lines.

In many countries telegraph lines are laid in subterranean pipes. When the existence of such a line is known, or suspected, marks, at equal distances apart, should be searched for, indicating the position of the test boxes. These boxes usually lie about 100 yards apart, if they have not already been removed by the enemy, and generally consist of blocks of wood or stone, numbered in succession. If the approximate position of the line is known, a cross trench may be dug about three feet deep at right angles to the probable direction of the line, and it is possible that in this way the pipes may be discovered.

Methods of Destruction.

If the subterranean line is discovered, the pipes can then be dug up and bent, or otherwise destroyed, the wire being pulled out and cut to pieces. If possible, the trench should be carefully filled in and all traces removed.

Methods of creating Faults.

Faults can be created in subterranean lines in the same way as they are created in aerial lines. Further, if a contact or a leak is to be caused, it should be done in exactly the same way, and the piece of copper wire, forming the connection, should be carried into the earth.

Even if the line has already been cut, the creation of a fault in some other place in the line will probably greatly increase any delay in repairing the line.

Subaqueous Lines.

A subaqueous line, which may, in war time, have been laid down in the bed of a river, can best be fished up with a grapnel, and when this has been done, as large a piece as possible should be cut out of it. The piece cut out should, of course, be destroyed or thrown into deep water.

Telegraph Offices.

If possession of any telegraph offices can be obtained, considerable damage may be done by destroying the batteries and disconnecting the wire. But any papers with directions for the working of the line, and any records of messages, as well as the instruments, if possible, should be brought away, and handed to a staff officer.

DEMOLITION OF BUILDINGS.

If there are not sufficient explosives to demolish, say, the two main walls of a building, it is often best to place a charge against two opposite corners, because this is more likely to affect the stability of the building than the partial destruction of the centre of two walls. In demolishing walls, if there is sufficient time, it is better to cut grooves in the brickwork, because it slightly reduces the amount of explosive required. Should a very small aperture be found in brickwork or masonry, or if it is possible to make one, two or three primers may be inserted, and then tamped and detonated. The effect of this will appreciably reduce the excavation to be made for the charge required for the main work. The charge can be placed at any height above or below the ground which appears most suitable. It can usually be more easily tamped if placed slightly below the ground level.

If of inflammable material, the remainder of the building may be destroyed by fire.

In the case of badly built or very old buildings, place a charge in the centre of each room, after having shut all the doors and windows. The amount of the explosives must depend on the size of the room and the thickness of the walls. The charges should be fired simultaneously.

DEMOLITION OF A STOCKADE.

In the demolition of a stockade, the width of the breach to be made should first be decided on, and the amount of the charge calculated accordingly. The charge should extend along the whole width of the proposed breach, and may be laid in the manner shown in Plate 77, lashed on a board. If the charge is to be laid within sight of the enemy, it is best for one man to carry the charge and lay it, while other men carry one or more small sandbags to be used as tamping. Two primers, two detonators, and two fuzes should be used and the charges fired as usual.

DEMOLITION OF A FORT GATE.

In the demolition of a fort gate, a charge of 50 lbs. of guncotton should be made up in bulk, that is, all the slabs should be lashed together in one bundle, and two primers, detonators, and fuzes attached. The charge should be laid, and the tamping placed, as in the demolition of a stockade.

INDIA.

DEMOLITION OF TOWERS ON THE N.W. FRONTIER.

Towers on the N. W. Frontier are usually made of stones laid in mud, and are often bonded together with beams of wood built into the walls and base. They are usually of one or two types.

(*a*) The first type has a *hollow* base and may have one or two stories above the room on the ground level.

(*b*) The second type has a *solid* base 12′ to 20′ high, and above that one or two stories.

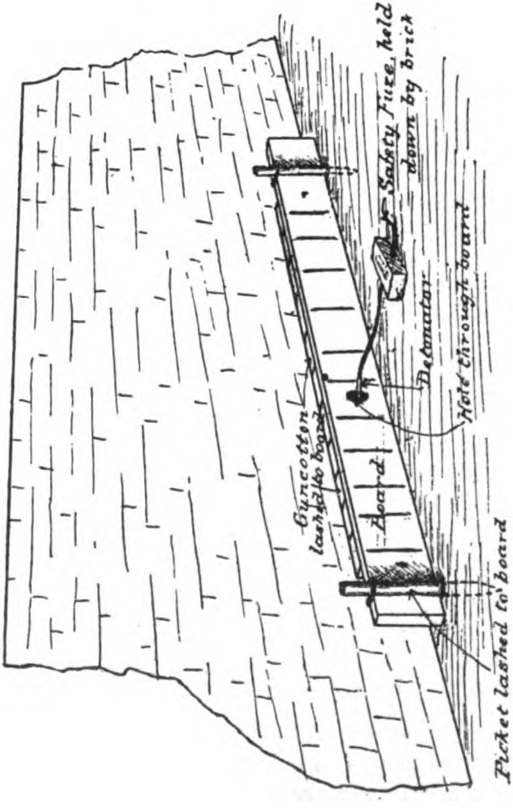
Both these types may be either square or round.

The simplest, most effective and quickest way of blowing them down is to dig a hole downwards in the centre of the bottom room of the tower, *i.e.* into the ground in type (*a*), and into the solid base in type (*b*).

The hole may be made from 2′ to 3′ deep, and about 2½′ in diameter.

Place in the hole *a single* charge of explosive—guncotton is best to use. This charge should have two primers, two detonators, and two pieces of fuse. Light the fuses and *shut* the door or block up the entrance.

PLATE 77.


Safety Fuze held down by brick
Detonator
Hole through board
Guncotton lashed to board
Board
Picket lashed to board

CHARGE PLACED AGAINST BRICK WALL

The amount of guncotton required is ascertained as follows:—

Measure the side of a square base or the diameter of a round base roughly in feet, add four, and this gives the number of lbs. required. Thus a tower of 15′ side or diameter would required 19 lbs. in one single charge. If dynamite is used instead of guncotton, increase the weight 25 per cent. The guncotton charge is prepared as detailed on p. 676.

Wherever possible the copper commercial detonator for guncotton (Nobel's Octuple, No. 8) should be used in preference to the red service detonator "No. 8 for Safety Fuse," the latter, especially if more than three years old, are often very unreliable in the Indian climate.

Sometimes cases are found where (i) the tower is solid for the whole of its height; or (ii) the ladder having been removed, no way can be found of getting into a tower of type (*b*). In these cases a hole must be driven from the outside, 4′ or so from the ground, horizontally, as far as the centre of the base of the tower, and a single charge, the amount of which is ascertained as stated above, is placed in the hole as near the centre as possible. A hole made in this way needs skilled men, and takes at least an hour to make.

Over two hundred towers of every type were successfully blown down on the above system in the Tirah Campaign of 1897, and in Waziristan, and fifty-seven towers of various types were destroyed in the same manner without a single failure in the Mohmand Expedition in May, 1908.

Native mills may be blown up by placing 7 or 8 lbs. of guncotton on top of the millstone and shutting the door.

These mills consist of a single-room hut about 8′ square.

DEMOLITION OF TREES.

In the case of trees which are not more than 12 inches in diameter, a necklace of guncotton primers, strung so that each primer is in contact with the next, and all of them touching the tree, will be sufficient to effect the demolition. A detonator and fuze can be attached, in the usual way, to one of the primers.

If the tree is more than 12 inches in diameter, a hole must be bored from one side right into the centre, and another hole from the other side, each of these holes being carefully rammed with the necessary number of primers. If there is no boring tool handy, a necklace of primers may be strung round the tree as in the case of trees under 12 inches. This will partially cut the tree through; the work being completed by exploding another necklace of primers.

DEMOLITION OF GUNS.

To destroy a gun, load a shell in the ordinary way, and pack the necessary charge of guncotton in behind it, so that the charge is in close contact with the shell and the sides of the gun. Then put in the primer, pack up the charge with sods, earth, paper, or other material that may be at hand, so as to ensure its keeping in position, put in the detonator and fuze as usual, and close the breech as far as possible, just allowing room for the fuze to pass out to the rear. For charge required, see p.676.

A shell is not absolutely necessary for destroying a gun by the above method, but it greatly increases the effect.

If no explosives are available, a gun may be rendered useless by the removal of the breech block, or failing that, by means of a sledge hammer or a stone, in one of the following ways:—

(1) Burr the threads of the screw of the breech block;
(2) Break the elevating screw (see Plate 78) or,
in the case of the new Q.F. gun,
(3) Dent in the slides on which the gun recoils.
(4) After closing the breech, withdraw the hand lever about 1″, then beat it down until the hinge-joint is distorted.

DAMAGE TO LOCOMOTIVES.

Damage to locomotives may be grouped roughly under two heads:—

1. That which causes so large an amount of injury as to prevent the locomotive being used for a considerable time;
2. That which temporarily disables it, but which can be easily remedied either by the persons who did the damage or by the persons in charge of the locomotive, provided that they are in possession of the proper tools and can replace the portion which has been removed.

A large number of ways of doing damage to a locomotive could be noted, but it has been thought better to mention only two which could be carried out by a person with little or no previous knowledge of a locomotive.

1. *Method of Injury which would cause Extensive Damage.*

The simplest method is, perhaps, to drop a number of bolts, nuts, or other hard substances not larger than ½″ in diameter down the blast pipe. Small stones from the ballast of the line will be available. The blast pipe will be found inside the smoke box, which in every engine is reached by simply opening the door in front of the engine; the blast pipe, marked B on Plate 79 (p. 710), will then be seen immediately under the funnel. There are various forms of blast pipe, averaging perhaps 6″ in diameter, but no other pipe can be mistaken for it. It is open at the top.

If any of these hard substances are dropped into the blast pipe, they will, directly the engine begins to work, be drawn into the mechanism and cause such extensive damage as will necessitate the engine being removed to the works and under repair for a considerable time.

This method of damage can be effected whether or not the locomotive is under steam.

Another method is to enter the cab and strike all wheels, levers, and handles in the cab with the butt-end of a rifle or a crow-bar.

PLATE 78.

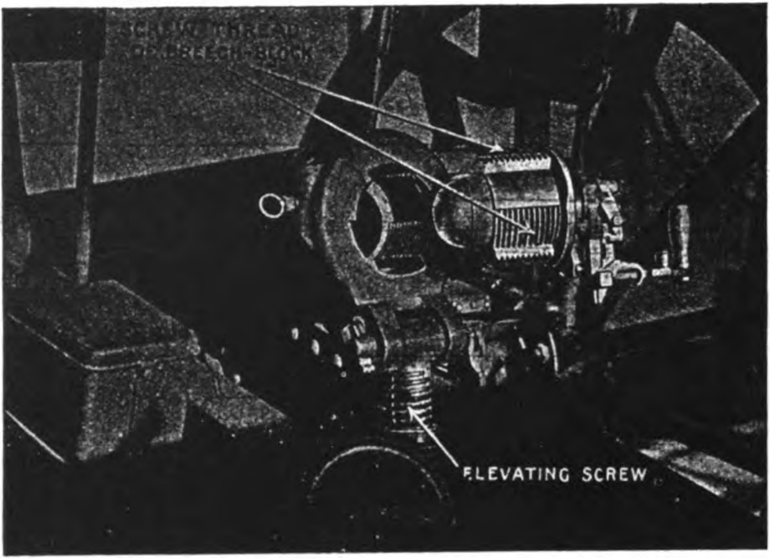
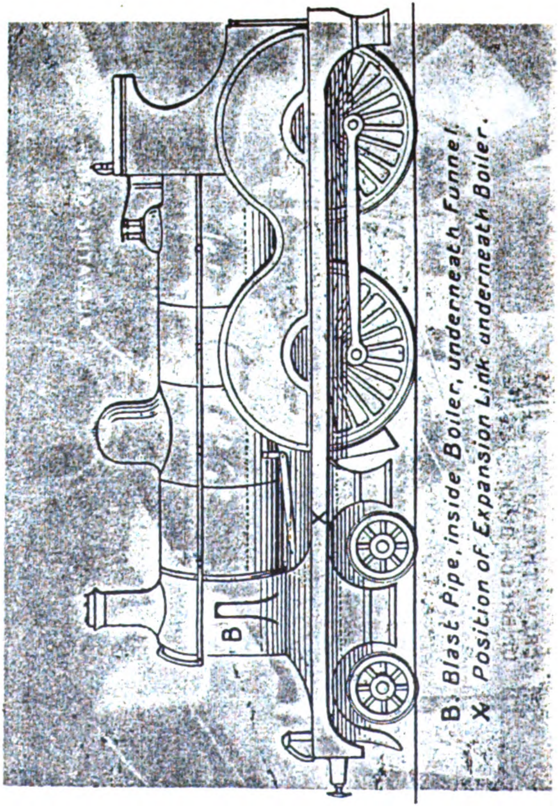
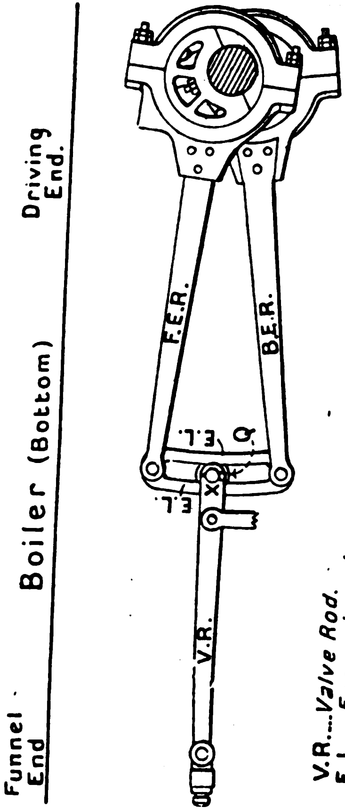

SCREW THREAD
OF BREECH BLOCK
ELEVATING SCREW

PLATE 79.



B. Blast Pipe, inside Boiler, underneath Funnel.
X. Position of Expansion Link underneath Boiler.

PLATE 80.


Driving End.
Boiler (Bottom)
Funnel End
F.E.R.
B.E.R.
E.L.
Q
X
E.L.
V.R.

V.R.....Valve Rod.
E.L.....Expansion Link.
F.E.R...Forward Eccentric Rod.
B E R...Back-gear Eccentric Rod.
Q.......Quadrant Block, to be removed by taking out Pin at X and driving Bolt through with Hammer and Chisel.

2. *Method of Injury which would cause Temporary Disablement.*

Underneath the boiler in approximately the position marked X on Plate 79 (p. 710), will be found the valve-motion. This is shown in detail in Plate 80 (p. 711). If the quadrant block is removed from the expansion link, in the manner indicated on that Plate, the locomotive will be disabled until the valve rod is again connected with the expansion link by replacing the quadrant block.

The removal of this block can be effected whether or not the engine is under steam.

DAMAGE TO MOTOR VEHICLES.

This may be of two natures.

1. Serious damage, necessitating the removal of the vehicle to a workshop for repair, or the services of a skilled mechanic with the necessary tools.
2. Temporary disablement, which may be remedied in a short space of time by any person with a knowledge of motor engines, provided he is in possession of the necessary spare parts.

Numerous methods of damaging a motor vehicle will occur to anyone possessing a knowledge of motor mechanism; but the instructions given below are for those who have not even an elementary knowledge of the subject.

1. *Methods of causing Serious Damage.*

(*a*) Puncture the pressure tank at rear of car; this can be done with the point of a bayonet or any sharp instrument.

(*b*) Give the starting handle a sharp blow with a large stone or anything available in order to bend it, and so prevent it being turned.

(*c*) Bend outwards by pulling or leverage both the brake and gear levers, so that they cannot be moved in the quadrant.

2. *Method of causing Temporary Disablement.*

(*a*) Take out the four sparking plug leads. These are thick insulated wires generally incased in a tube; if no time to detach both ends leave them hanging loose.

(*b*) Remove and take away magneto; this is easily done, as it is held in position by a strap and wing nut. If magneto is fixed, remove the distributor found at one end, secured by a clip, and to which the four leads are attached.

(*c*) Obtain screw wrench or spanner from tool bag or locker and remove the carburetter; this is detached merely by loosening the nuts in the top flanges.

WIRING FORDS.

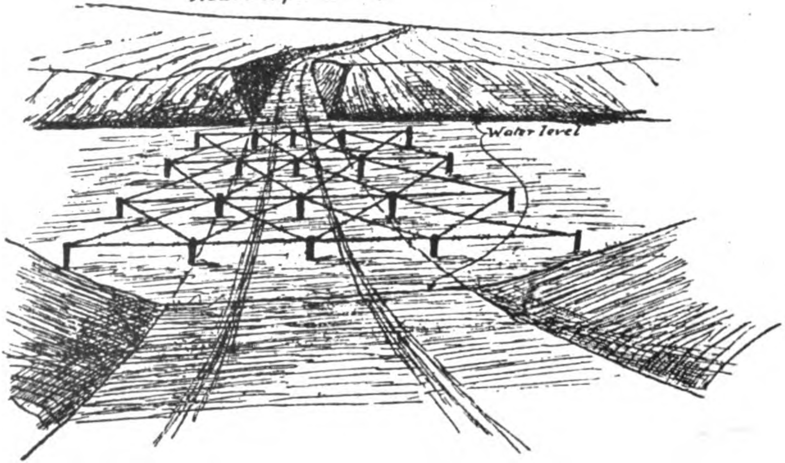
The object in wiring fords is the same as that of all other obstacles, *viz.* to obstruct as far as possible the passage of a force, either to prevent it crossing or to delay its progress, so that a heavy fire may be opened on it from some covering position. The best way to effect this is to ascertain the breadth of the ford, then drive in short posts about two feet high at the edge of the ford, and stretch barbed wire between these posts diagonally across the ford, as shown in Plate 81. Large stones should be placed on the inside of those posts which are on the edge of the ford, so as to assist in supporting the wire when heavy pressure is brought to bear on it. No portion, of course, of the posts or wires should be visible from the banks. There are two methods of actually driving in the stakes; either the stakes must themselves be long enough to project above the water, and then after having been driven in must be sawn off, or a piece of wood or something which itself projects above the water, must be rested on the stake and hammered. Stakes should be driven in as follows, *vide* Plate 81:—Drive them into the ground about six feet apart, in rows arranged chequer-wise, their heads being connected by strong wire, crossing diagonally about one foot or eighteen inches above the ground. Barbed wire is, of course, much better than plain. Roughly, one foot of wire is required for each square foot of ground to be covered. It will add to the

PLATE 81.

WIRE ENTANGLEMENT IN FORD

River bed shown dry.

Heads of pickets below water level.



strength of each line if a peg is driven in at either end and a piece of wire or thin rope attached to the end post.

DEFENSIVE WORKS.

Defence of Buildings.

It is only worth while preparing a building for defence when artillery is not likely to be brought against it, or where it is screened from artillery fire.

Steps to put Buildings in State of Defence.

The most important steps to take in putting a building in a state of defence are to:—

(1) Obtain a clear field of fire by demolishing, or making useless to the enemy, any surrounding buildings which it is not intended to hold, and by destroying any cover available for the enemy.

(2) Barricade the ground floor, doors, and windows with any material available, such as old bricks, bags, boxes, casks, wardrobes, etc., filled with stones. A good method of barricading windows is to nail planks both on the outside and inside of the frames, filling the space with stones. The upper floor windows should also be barricaded to a height of six feet, so that, by standing on a chair, one is able to fire over the barricade.

(3) Make loopholes in windows and doors.

(4) Make loopholes in walls, wherever required.

Care must be taken that all loopholes are either more than 4 ft. 6 in. above the ground level outside, or that some obstacle is provided, say, a bank of earth heaped up against the wall, in case the enemy gets close under the wall and tries to fire through the loopholes.

It is most important to provide for flanking fire along the length of any wall, so as to prevent the enemy getting close to the wall and either laying a charge to blow down the wall or otherwise effecting an entrance. One method of providing for flanking fire is to make loopholes in the side of a porch or bay window.

(5) Lay in as large a store of ammunition, food, and water as possible; taking care to put the ammunition and water where it is not likely to be hit by bullets.

(6) Collect a heap of earth in each room in case of fire.

TABLE OF MAXIMUM PENETRATION OF POINTED BULLET.

Material.	Max. penetration.	Remarks.
Steel plate, best hard .	$\frac{7}{16}$ in.	At 30 yards normal to plate; $\frac{3}{16}$ in. is proof at not less than 600 yards; if plate is set at slope of $\frac{3}{4}$, $\frac{3}{16}$ is proof at 250 yards.
Ditto, ordinary mild or wrought iron	$\frac{3}{4}$ in.	
Shingle	6 ins.	Not larger than 1 inch-ring gauge.
Coal, hard	9 ins.	
Brickwork, with cement mortar	9 ins.	150 rounds concentrated on one object will breach a 9 in. wall at 200 yards.
Ditto, with lime mortar .	14 ins.	
Concrete	9 ins.	
Chalk	15 ins.	
Sand, confined between boards or in sandbags	18 ins.	Very high velocity bullets have less penetration in sand at short than at medium ranges.
Hard wood, *i.e.* oak, with grain	38 ins.	
Soft wood, *i.e.* fir, with grain	58 ins.	
Earth, free from stone (unrammed)	60 ins.	Ramming earth reduces its resisting power.
Clay	60 ins.	Varies greatly. This is maximum for greasy clay.
Dry turf or peat . . .	80 ins.	

In order to obtain absolute proof, add at least 25 per cent. to the numbers above, *i.e.* an earth parapet should be 6 ft. thick.

ENTRENCHMENTS.

Classification of Earthworks.

Earthworks may be classed under two headings: Redoubts and Entrenchments. The former would be constructed under the direction of the R.E., and it is proposed therefore to deal here only with Trenches. The construction of an elaborate system of entrenchments for the purpose of a siege is also beyond the scope of this book, as they also would be constructed under skilled direction. It is proposed merely to deal with trenches which will have to be made without the assistance of technical troops.

Utilisation of Existing Cover.

Existing cover, such as hedges and ditches, should, particularly when time is of importance, be utilised and improved, *provided* that it is not so situated as to be likely to draw a large amount of fire as, for instance, a hedge or ditch on a skyline or in some other very prominent position. If a site as this is chosen for a trench, not only will it be likely to draw a large amount of rifle fire, but it will be easy for the artillery to range on, and the trenches will come under such heavy fire that it will be very difficult for the defenders, particularly without head cover, to keep their heads up and to maintain a steady fire.

In such cases existing cover will be best left alone and the trenches constructed in some less prominent position.

Siting of Trenches.

In the case of a hill there are, broadly speaking, 3 sites which may be chosen for trenches; firstly, the advanced site, that is, nearly at the foot of the hill; secondly, the crest site, that is, at the top of the slope which affords a full view to the front; and, thirdly, the back site, that is, in rear of the crest site and at the beginning of a reverse slope.

The relative advantages of each of these sites are as follows:—

Advanced site—

Advantages: (1) Brings ground at foot of convex slope under fire; (2) Difficult to locate; (3) If ground is level, site will be suitable to trajectory of rifle and dangerous zone will be of great depth; (4) Supports and reserves safe from unaimed fire.

Disadvantages: (1) Difficult to support or withdraw troops from trenches so situated; (2) Difficult to supply food, water, and ammunition; (3) Necessary to man the trenches early. If, however, the ground is suitable and connecting trenches can be dug, these three disadvantages can to a certain extent be overcome; (4) If the ground is broken, the lack of command over the ground in front may be serious.

Crest Site—

Advantages: (1) Good field of fire and view; (2) Full power of rifle can be used; (3) Supports can be considerably closer; (4) Construction of communication trenches may be easy; (5) Trenches need not be manned until enemy exposes a target; (6) Freedom of movement retained.

Disadvantages: (1) Crest line an easy target; (2) If slope is convex, foot of slope is dead ground; (3) Fire is more or less plunging, and the depth of the dangerous zone is therefore considerably reduced.

Back site—

Advantages: (1) Good cover for supports or led horses close at hand; (2) Immunity against artillery fire; (3) Concealment; (4) Difficult to reconnoitre and will probably come as a surprise to the enemy.

Disadvantages: (1) Dead ground beyond forward crest; (2) Full power of fire is not used.

A clear field of fire for a certain distance in front of a trench is of paramount importance, and must be the first consideration. So long as that can be obtained, the site to be adopted in any particular case must depend on the circumstances of that case; for instance, if the configuration of the ground is such that it reduces to a minimum the disadvantages of any particular site, that site should as a general rule be chosen. On the other hand, if it is essential to prevent the enemy from seizing some special point, the site should be chosen from which the most effective fire can be brought to bear on that point.

A force weak in artillery will probably avoid a crest line or similar position exposed to long range fire, while a rear guard or mounted force may be best suited by a position at the rearward crest of a plateau whence withdrawal is easy.

A weak force in an extended position, with insecure flanks, will require freedom of movement, and this may be retained by holding high ground with plenty of depth in the position and fire trenches which are linked by communication trenches to the interior of the position.

Best Form of Fire Trench.

The best form of trench must depend on the time, labour, and tools available, but the following points should be borne in mind:—

(1) The bank of earth in front must be bullet proof at the top.

(2) The trench should be as invisible and narrow as possible, taking into consideration the fact that, unless there is a step, it must be wide enough for men to sit in.

(3) The front side of the trench should be cut as deeply as the soil will stand, since better cover for the defenders from dropping bullets is thus obtained. If the soil is soft, it should be revetted, that is, kept up by hurdles, gabions, or some other form of revetment.

(4) The interior of the trench should as far as possible be protected from enfilade fire, *i.e.* from bullets which sweep the trench lengthways.

(5) Drainage must be provided for, or after heavy rain the men will probably be up to their waists in water.

The trench shown on Plate 82 fulfils these requirements, and is of a simple form; it also has the advantage that, if time allows, it can be easily deepened or widened. An untrained man would take about 1½ hours to excavate two paces' length of this trench in moderately easy soil.

Looking at Plate 82, it will be seen that a man can both stand in the trench, close up against the front side, and fire his rifle over the bank of earth in front, while resting his elbows on the ledge provided for the purpose.

In entrenching an isolated position, such as a detached post, the trenches must be constructed so that fire can be brought on the flanks and rear, as well as on the front.

Advantages and Form of Head Cover in Trenches.

It is shown in Plate 82 how the men's heads are protected by head cover in the form of loopholes made of sandbags. It is important for the better protection of the men that head cover should be constructed, either of sandbag or stone loopholes, or simply of small notches in the bank of earth for each man to put his rifle in. Another form of loophole is a slit running all along the trench, except for the supports of the material above. This form of loophole has the advantage of giving a wide field of view all round, is less likely to leave any ground uncovered by the fire of several men, is easier to make, and is in addition more economical of material. One disadvantage of head cover is that it tends to diminish the number of rifles that can be put in the firing line, besides reducing the field of view as well as of fire. In constructing head cover it requires careful arrangement to obviate these disadvantages.

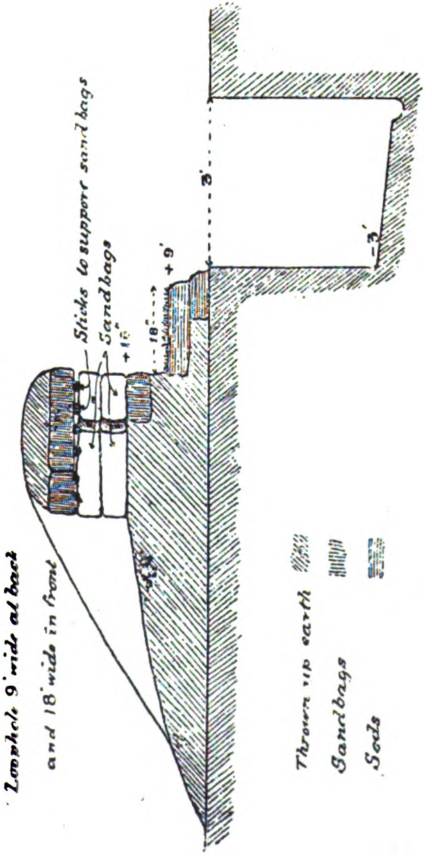
Form of Loopholes.

Loopholes made with turf or sandbags may have the larger opening either inside or outside. If the larger opening is inside,

PLATE 82.

FIRE TRENCH WITH SANDBAG LOOPHOLE

Section through loophole
Scale 1/40


Loophole 9" wide at back
and 18" wide in front
Sticks to support sand bags
Sandbags
+15"
18"
+9"
3'
3'
Thrown up earth
Sandbags
Sods

the loophole is very much less conspicuous, which is sometimes a point of great importance. If the larger opening is outside, a defender can fire with much greater facility, since he can cover the whole arc without moving his position. Though loopholes made with hard material, such as stone, must have the larger opening inside, in order to prevent bullets ricocheting in, the choice in other cases must depend upon the requirements of the position. In places where concealment is essential the front of the loophole should be masked, until it is required, with branches or sods or pieces of canvas hung behind it.

Shell-proof Shelters.

If it is desired to secure the interior of any portion of the trench against shrapnel bullets, or splinters of shell, it may be covered with branches, corrugated iron, canvas, or any other available material, with about 12 inches of earth piled on the top.

Precautions against Enfilade Fire.

Trenches which may be exposed to artillery fire coming obliquely, or to an enfilading rifle fire, must be either :—

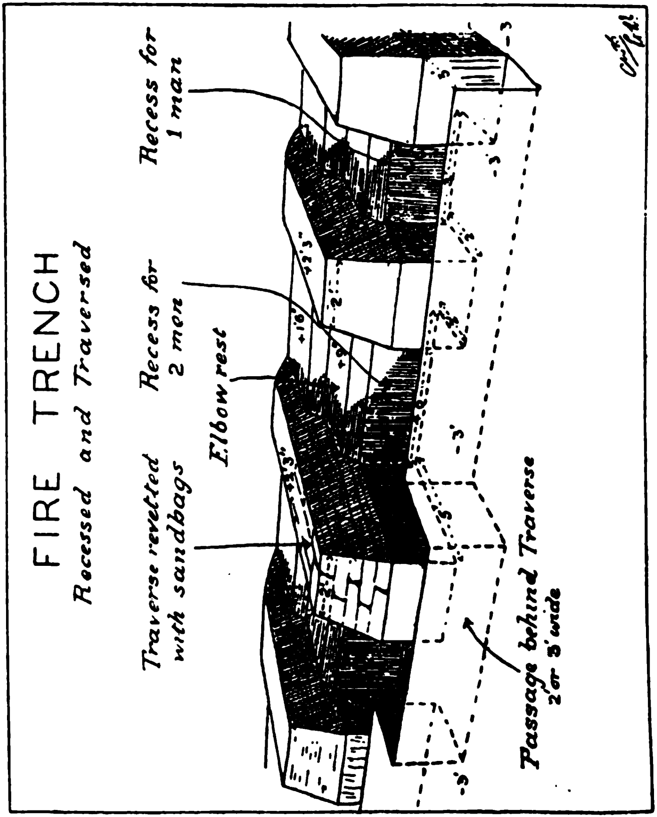
(1) More or less in the form of a semi-circle ;
(2) Zig-zag ;
(3) In short lengths, in echelon ; or
(4) Traversed and recessed.

Traverses.

Traverses are shoulders of earth or other materials interposed in a trench, and stretching right across it every few feet. These traverses must be of sufficient thickness to be bullet-proof. (See Back View of Fire Trench on Plate 83, p. 723.)

A traverse should be constructed between every two or three men. Traverses which are merely intended to localise the burst of a shell may be constructed of two walls of brushwood with about one foot of earth between them. In order to pass round a traverse and so move along a trench, a small

PLATE 83.



FIRE TRENCH

Recessed and Traversed

Traverse revetted with sandbags
Elbow rest
Recess for 2 men
Recess for 1 man
Passage behind Traverse 2' or 3' wide
5'
3'
2'
4'3"
1'6"

passage two feet wide and of the same depth of the trench should be cut behind the traverse.

Recesses.

Recesses are cut into the bank of earth in front, large enough to hold one or two men each. They should be made after the trench has been completed. (See Plate 83.) A small recess may also be cut every few yards in the parapet for boxes of ammunition, while ammunition dug-outs may be constructed just in rear of the trenches.

Undercutting front of Parapet.

If time permits and the earth is sufficiently stiff, the inside of the parapet may be hollowed out a little in order to provide more cover from plunging fire when troops are seated in the trenches.

Advantages of gradually deepening a Trench when digging it.

When constructing a trench round a post, each man should first dig out the whole of his allotted portion to a uniform shallow depth, and then gradually deepen it. It should not be dug out the proper depth in one place and the rest left untouched, because if the post is attacked in the meantime, so much protection would not be obtained as if it were shallow throughout.

Earth should not be rammed.

Earth thrown up in entrenchments should not be rammed. Sixty inches of unrammed earth will stop a bullet at point blank range, but if the earth is rammed, it will require considerably more.

Advantage of a "Dummy" Embankment.

If there is sufficient time it is well to construct a dummy embankment, as if for a trench, in some prominent position, such as on the sky-line. This may very likely draw the enemy's fire.

Importance of Concealment.

Newly turned earth, which is often conspicuous at considerable distances, particularly if it is of a light colour, should be hidden by making it as like its surroundings as is practicable. The Russians suffered considerably during the late war owing to their neglect of this precaution. If green scrub is used to hide earth, it must be remembered that it may wither by the second day and change colour, thereby becoming more conspicuous.

It is important in a trench not provided with head or overhead cover that the men's heads should not show conspicuously above the parapet ; to avoid this, if the men's heads show up against the background, earth can be piled up behind the trench to a sufficient height ; this has another advantage in that it protects the men from the back burst of shells that burst behind the trenches.

Protection from Hand Grenades.

To protect themselves against hand grenades while working in the trenches close to the enemy's line, the Japanese used rectangular wooden frames about 7 feet by 4 feet, with stout wire netting projecting above the parapet.

CLEARINGS.

Object of Clearings.

In taking up a defensive position the two main objects are:—

(1) To get the freest possible use of the defender's weapons ;

(2) To impede the progress of the attacker, and, as far as possible, to deny him the use of his weapons.

In most countries, and especially in a close country like England, it is usually necessary for this purpose to clear the front of a defensive position.

Directions as to Clearings.

When clearing ground the following considerations must be borne in mind:—

(1) The ground immediately in front of the position should be cleared first, and then that immediately beyond, and so on—so far as time permits ;

(2) Subject to the following considerations, as long a distance as possible should be cleared in front of the position ;

(3) If any trees, hedges, walls, etc., which are on the defender's position, serve to screen his movements, it is often best to leave them standing ;

(4) Hedges and such-like obstacles which do not interfere with the defender's field of fire and which lie, for instance, at right angles to the front of the position and which might impede the attacker's advance, should be left standing, or even improved as obstacles, provided they will not interfere with the defender's counter-attacks ;

(5) All hollows and ground which cannot be seen into from the position, and which might give shelter to the attacker close to the position, should be filled in with abbatis, débris of walls, etc. ;

(6) In deciding whether to cut down trees or not, it must be remembered that a large tree lying on the ground gives more cover than when it is standing ; also that trees are difficult to cut down, and still more difficult to move when down. It would usually be more advisable to simply lop off the lower branches of the trees so that they do not interfere with the defender's view ;

(7) When demolishing walls and houses, it must be borne in mind that the débris is very difficult to move, and that if not removed it possibly gives better cover to the attacker than if the wall or house is left standing.

WORKING PARTY TABLE.

The tables on pp. 728–731 afford a rough estimate of the time, men, and tools required to clear ground. The table must not be taken as a certain guide as to the time required, since it is not possible to foresee all the difficulties that may be encountered.

OBSTACLES.

Conditions Governing their Erection.

Obstacles, judiciously placed, add very much to the strength of a defensive position, and are especially effective against night attacks.

The following conditions must be observed:—

(*a*) They should be under the close fire of the defenders; they should afford the enemy no cover, and should be sheltered particularly from his artillery fire. The outer edge of the entanglement should not be more than 100 yards from the parapet. For small posts or redoubts it should be quite close so that it can be effectively defended at night; but if it is closer than about 100 yards it is possible to throw hand grenades over the parapet.

(*b*) They should be difficult to remove or surmount. Special attention must be paid to the security of the anchorages of the posts.

(*c*) They should be arranged so as not to impede a counter-attack, but if gaps are left, these gaps should be protected by one of the lines overlapping.

(*d*) They should, if possible, be so placed that their existence comes on the attackers as a surprise, and for this purpose should be constructed, where possible, among long grass or brushwood which would afford concealment.

(*e*) It is essential that the obstacle should be made impossible to crawl under without first cutting it.

Wire Entanglements.

Of the various kinds of obstacles that can be improvised, those made of wire only will be taken into consideration here.

(1) A "low wire entanglement" is formed by stout stakes driven into the ground about six feet apart, in rows arranged chequer-wise, their heads being connected by strong wires twisted round them and crossing

WORKING PARTY TABLE.

Nature of work.	Dimensions.	No. of men.	Time.	Amount.	Tools.	Remarks.
ENTRENCHMENTS. 1. *Entrenchments* .	—	1	1 hr. or 4 hrs.	30 cub. ft. or 80 cub. ft.	1 pick and 1 shovel per man	In average soil in one relief. For constructing head-cover of sand-bags and sods on earth parapet, allow ½ hr. to 1 hr. in addition to time taken in excavating trench.
2. *Revetments.* (*a*) Making fascines.	18′ long × 9″ diameter	5	1 hr.	1	1 measuring rod, 1 choker, 3 billhooks, 2 knives, 1 maul, 1 hand-saw, 1 pair of pliers	Materials : 4 bundles of brushwood, 60′ of wire or spun-yarn if withes are not used. Weight about 140 lbs.
(*b*) Brushwood gabions	2′ 9″ high, 2′ external diameter	3	2 hrs.	1	1 billhook, 1 mallet, 2 knives, 1 measuring rod	Materials : 1½ bundles of brushwood. Weight complete about 50 lbs. Revetment 7′ 6″ high requires 14 gabions and 3 fascines per 100 sup. feet.

WORKING PARTY TABLE—*continued*.

Nature of work.	Dimensions.	No. of men.	Time.	Amount.	Tools.	Remarks.
(*c*) Band gabions	Ditto	2	10 mins.	1	—	Materials : 10 bands, 10 pickets. Weight complete, 13 lbs.
(*d*) Hurdles .	6′ long, 2′ 9″ high.	3	2½ hrs.	1	2 billhooks, 2 knives, 1 mallet, 1 pair of pliers (if sewn with wire)	Hurdle revetment 2′ 9″ high requires 9 bundles brushwood, wire and stakes for anchoring per 100 sup. feet.
(*e*) Cutting sods	18″ × 9″ × 4½″	3	1 hr.	100	Sharpened spades or sod-cutters	
(*f*) Sand-bags .	20″ × 13″ × 5″ when filled	2	1 hr.	70	Spades	1 cub. yd. of earth fills 50 bags. Two men, if supplied with bags by carriers and fillers, lay 70 bags in 1 hr. in a revetment. 200 bags are required per 100 sup. feet.
3. *Defence of walls.*						
(*a*) Loopholes in walls two bricks thick	—	1	½ hr.	1	Crowbar or pick	
(*b*) Notches in wall two bricks thick	—	1	10 mins.	1	Ditto	

WORKING PARTY TABLE—*continued.*

Nature of work.	Dimensions.	No. of men.	Time.	Amount.	Tools.	Remarks.
CLEARINGS. 1. Felling trees	Up to 1′ diameter	1 man	1 minute per inch of diameter	—	Felling and hand-axes, cross-cut and hand-saws	For larger trees the diameter in inches cubed and divided by 144 will give the number of minutes. With the hand-axe allow 2 mins. per inch of diameter for trees up to 1′; for trees over 1′ allow twice the calculated amount.
2. Cutting brushwood	Up to about 1½″ diameter	1 man	4 hrs.	100 sq. yds. or 9–10 bundles of 50 lbs. each	Billhooks, lashing, or wire; a small proportion of felling axes, hand-axes, and saws; a grindstone; a few whetstones	Men opened at 4 yds. interval should cut 25 yds. to their front in 4 hrs.

WORKING PARTY TABLE—*continued.*

Nature of work.	Dimensions.	No. of men.	Time.	Amount.	Tools.	Remarks.
3. Clearing plantation of brushwood with trees up to 12″ diameter; sorting, binding, and carting	100 yds. × 40 yds.	100 men	4 hrs.	about 300 bundles of 50 lbs. each	Ditto	40 men cutting, 40 men sorting and binding, 20 men carting.
4. Cutting hedge .	Wood ½″–2″ diameter	1 man	6 mins. to 18 mins.	2 paces	Billhooks and hand-axes	If very bushy a pole and ropes can be used to expose the lower branches to the axe.
OBSTACLES.						
(*a*) Abattis roughly constructed	50 yds. deep	1 man	1 relief	2 paces	Felling and hand-axes, cross-cut and hand saws	Trees used where felled.
(*b*) Low wire entanglement	—	10 men	1 hr.	100 sq. yds.	3 billhooks, 1 maul, 2 pairs of cutting pliers	1 sq. ft. of entanglement takes 1 ft. of wire.
(*c*) High wire entanglement	—	5 men	4 hrs.	20 yds. length	2 billhooks, 2 mauls, 2 pairs of cutting pliers, 1 hand-saw	1 sq. ft. of entanglement takes 3 ft. of wire. Entanglement built with 3 rows of pickets, each 2 yds. apart.

diagonally about one foot above the ground, as shown in Plate 81, p. 714.

(2) A "high wire entanglement" forms an effective obstacle, especially if barbed wire is used. It is formed by driving pickets, averaging four to five inches in diameter and five to eight feet long, into the ground, about six feet apart in parallel rows. The method of joining the wires is shown in Plate 84.

(3) Another better form of high wire entanglement is constructed by driving the posts in at irregular intervals, five to eight feet apart, and to varying heights, and hammering in large nails into the heads of the posts. Each post should be joined with plain hand wire, head to foot and foot to head to all the adjoining ones, the wire being wound round the posts and secured by staples made of wire. Barbed wire should then be hung in festoons between the posts in an irregular manner, and fastened to the posts by short lengths of plain wire.

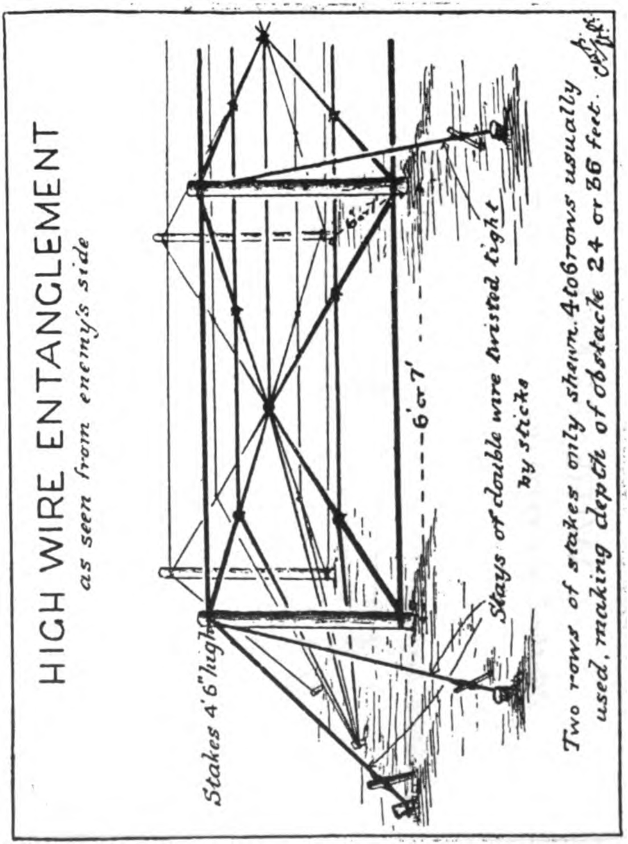
(4) An existing wire fence can be improved by the addition of other wires so as to form an "apron," as shown in Plate 85, p. 734.

Abattis.

Abattis may be formed in either of the following ways, but it must always be remembered that it is not possible to drag trees more than a very short distance when cut down, and hence abattis can only be built when trees are growing at, or close to the position in which the obstacle is required :—

(1) By cutting down trees and stripping them of their leaves and twigs, leaving the bare boughs and pointing the ends. The trees should then be laid either lengthwise, or, better still, if a large number of trees are available, with the branches pointing to the front. In any event the trees should be so laid that the

PLATE 84.



HIGH WIRE ENTANGLEMENT
as seen from enemy's side

Stakes 4'6" high
6' or 7'
6' or 7'
Stays of double wire twisted tight by sticks

Two rows of stakes only shewn. 4 to 6 rows usually used, making depth of obstacle 24 or 36 feet.

PLATE 85.

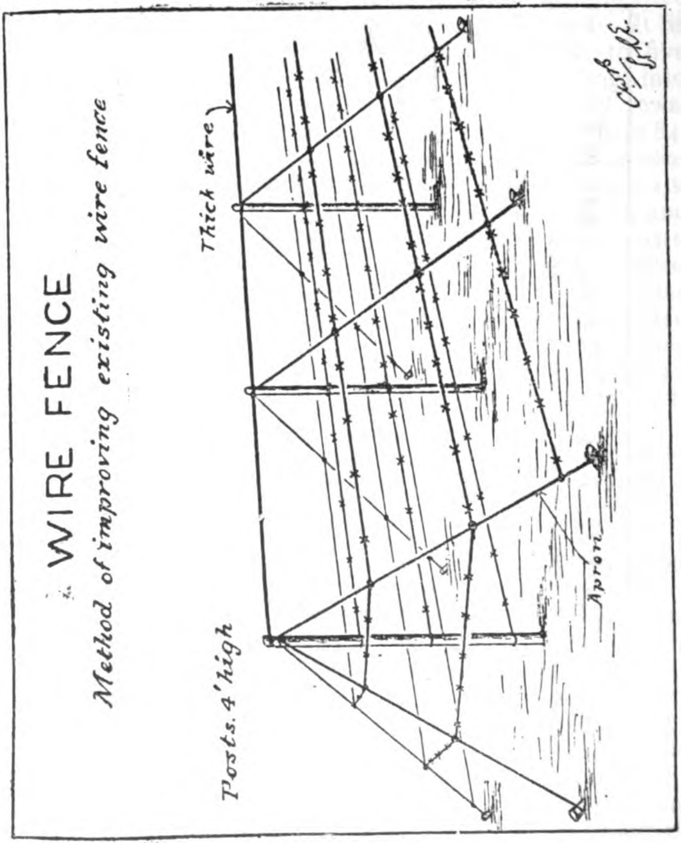
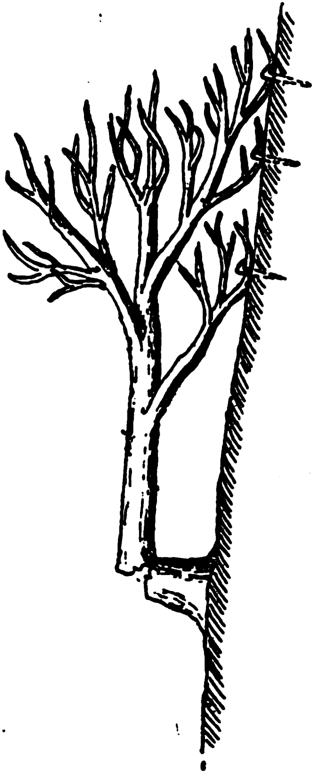

WIRE FENCE
Method of improving existing wire fence
Thick wire
Posts 4' high
Apron

PLATE 86.



Tree Entanglement.

branches are close enough to form an obstacle which, though not impenetrable, will yet prevent an enemy pushing quickly through it. The trees should be picketed down and fastened together with wire or rope, as shown in Plate 86, p. 735, so as to render them more difficult to pull apart. A better obstacle is made if trees or branches can be tied together by running a few strands of wire through them;

(2) When only small trees are available, by digging several rows of V-shaped trenches about two feet deep, putting the trees, stripped of their leaves and with the branches pointed, fairly upright in the trenches, and fixing them into the ground with pickets. The trenches should then be filled up with the excavated earth.

Automatic Alarms and Flare Lights.

Automatic alarms and flare lights are useful against night attacks. They should be used in combination with obstacles, and either protected or screened, to prevent the enemy removing them. Flare lights must be screened in rear so that the defenders may remain in shadow.

One of the simplest forms of alarms is a row of tin pots, each containing a few pebbles, hung on a wire fence so as to rattle when the latter is disturbed.

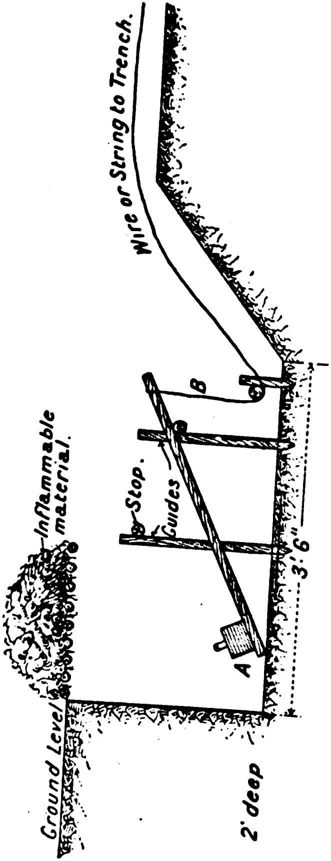
Rifle alarms fixed in connection with a wire fence or trip wire can also be used, but a spring bell, such as a bicycle bell, forms a better alarm signal than the rifle where the discharge of a rifle is of frequent occurrence.

Alarm signals and flares must always be so arranged that they can be operated at will by the defenders and not only by the enemy.

The following is an easily constructed and simple flare light:—

A lamp, A, is fastened to the end of a stick arranged as shown in Plate 87. A string, B, is fastened to the other end of the stick, carried round a smooth horizontal piece of wood and thence to the defender's position. Inflammable material

PLATE 87.


Wire or String to Trench.
B
Stop.
Guides
Inflammable material.
A
3' 6"
Ground Level
2' deep

is arranged above, and so placed that when the string is pulled the flame of the lamp is lifted into the midst of this inflammable material. A jam or tobacco tin makes a good lamp, which should burn throughout the night.

BRIDGING.

Choice of a Site.

When deciding on a site for a bridge, the following local and tactical points must be taken into consideration :—

Local Considerations.

1. General.

The width and depth of river, and nature of its bed; whether it is navigable, and if it is tidal, the rise and fall of the tide.

2. Current.

Force of the ordinary current ; if tidal, the maximum velocity of current on the ebb or flow ; whether river is liable to any sudden rise caused by a bore or floods.

3. Banks.

Whether steep, shelving, marshy, or firm, and if artificial, of what material, and whether roads run down to the banks.

4. Existing facilities.
   - (*a*) Whether any material such as timber, rope, or wire exist in the neighbourhood suitable for the construction of bridges, and if so, in what quantities ;
   - (*b*) Whether there have been any existing arrangements for crossing the river which have been destroyed.

Tactical Considerations.

5. Protection during crossing.
   - (*a*) Whether the position of the proposed bridge is likely to be exposed to the fire of the enemy's artillery ;
   - (*b*) Positions for the covering artillery, and the extent and nature of the ground which can be covered from them.
6. Nature of opposite bank.
   - (*a*) Whether the country offers facilities for the advance of troops ;

(*b*) Whether troops who had crossed could take up any covering position.

To take these in their order.

LOCAL CONSIDERATIONS.

(1) *General.*

On the width and depth of river and nature of bed will depend to a large extent the type of the bridge. Reference should be made to the table on pp. 741, 742.

If the river is navigable, provision will probably have to be made for boats passing under or through the bridge.

(2) *Current.*

Trestle and floating bridges are the only bridges affected by current. If the rate of the current does not exceed two to three miles an hour, no special provisions need be made; but if the force of the ordinary current is likely to be increased by floods so that the maximum velocity is greater than three miles an hour, provision must be made, in the case of floating bridges by laying down extra anchors, and in the case of trestle bridges by fixing guys from the bridge to points on the bank some way up stream. It will also add to the rigidity of the bridge if guys are fixed from the bridge to points some way down stream.

Some form of floating or stationary boom must be fixed a little distance above the bridge in order to catch any tree trunks or other floating material which might damage the bridge.

One method of measuring the strength of current is to take a rod, and, after tying a stone to one end, put it in the water and let it float down in a nearly vertical position for some little distance. Measure the time it takes to float this distance, and divide the number of feet it floats in a second by seven-tenths; the result will be the number of miles per hour which the current flows.

(3) *Banks.*

If the banks are steep and high, the roads leading on and off the bridge must be wide and of very easy gradient. This is of great importance to prevent any check and consequent crowding on the bridge. One in seven is the maximum gradient for guns.

(4) *Existing Facilities.*

If any facilities for crossing the river have existed and have been destroyed by the enemy, they should be carefully inspected in order to see how far they can be utilised.

TACTICAL CONSIDERATIONS.

(5) *Protection during Crossing.*

If otherwise suitable, the most sheltered position should always be chosen in order to obtain such cover as is possible from the enemy's fire, and particularly from that of his artillery.

The safety of the bridge from a tactical point of view will obviously be increased if there are suitable positions from which one's own artillery can cover it.

(6) *Nature of Opposite Bank.*

Ground which offers facilities for troops to advance and take up some position on the far side in order to cover the crossing of more troops has obvious advantages.

A concave bend of the river, that is, the inside of a bend, generally affords a more favourable site than a convex bend, that is, the outside of a bend, since the covering troops can take up a position on the opposite side with their flanks resting on the river and covered by fire from the near bank.

Material for Bridges.

Bridges can be made of almost any material, such as timber of all sizes, railway material, or bamboos. If timber is used, the approximate dimensions of the spars, etc., which are required to carry infantry in fours, is given in the following table. The fastenings in any kind of temporary bridge can be made with either wire, rope, bolts and nuts, or spikes.

Width of Bridges.

The normal width of a bridge should be at least 9 feet in the clear. This width will be sufficient for guns, G.S. wagons, pontoon wagons, infantry in fours, and cavalry in half-sections.

Camber.

In order to allow of lashings stretching and the centre of the bridge sinking, all bridges except floating bridges are usually constructed with a slight rise in the centre of about $\frac{1}{80}$ the span, which is called the camber.

FORMS OF BRIDGES.

The following are the different forms of temporary bridges:—

Form of bridge.	Maximum length.	Approximate dimensions of spars, etc.	Remarks.
1. Bridges without intermediate support.	Depending on length and strength of spars available.	Transoms, mean diameter 10". Ledgers, 4"–6". Road-bearers, mean dia. 7". Hand-rails, 4"–6". Braces, 3" at tip. Ribands, 3". Lashings for transoms and ledgers, 2" rope. Other lashings, 1½–1" rope.	For small streams, ditches, hollows, culverts, etc.
2. Trestle bridges. Plate 90, p. 749.			Suitable if river bed is fairly even; can be used in streams 6' deep and velocity 3½ miles per hour.
(*a*) Two-legged.	Any length	Legs, mean diameter 6"; other spars, etc., as in (1) above.	
(*b*) Three-legged.	,,	ditto.	Useful with muddy bottoms, in tidal rivers or in streams liable to floods.
(*c*) Four-legged.	,,	ditto.	Can be used in still water up to 10' deep and in streams 3' deep running 2 miles per hour.
3. Pile bridges.	,,		

Form of bridge.	Maximum length.	Approximate dimensions of spars, etc.	Remarks.
4. Single lock bridges. Plate 99, p. 765.	30 feet	Legs, 7″ at tip. Frame transoms, mean dia. 6″. Remainder of spars as in (1) above.	Suitable in places where it is not possible to touch bottom.
5. Double lock bridges. Plate 100, p. 767.	45 feet	Distance pieces, mean dia. 11″. Remainder of spars, etc., as in (1) and (3) above.	ditto.
6. Cantilever bridges. Plate 101, p. 769.	Any length		A very strong form of bridge, but requiring a large amount of material.
7. Suspension bridges. Plate 102, p. 771.	Except when of special construction and of steel, do not exceed 200 feet.		Suitable in places where timber is scarce and no footing can be obtained in the river-bed; but skilled labour is required for its construction.
8. Floating bridges. Plate 109, p. 783.	Any length	For bridges of casks: Gunnels, 5′ × 4″. Tie-baulks, mean dia. 4″. Cables for anchors, 3″ rope. Slings, 2½″ rope. Braces, 1½″ rope. Other spars, etc., as in (1) above.	Suitable in rivers where the current does not exceed, say, 6 miles an hour.

N.B.—All the above are calculated to carry Infantry in fours crowded at a check, which is equivalent to 5 cwt. per foot run, and are for *unselected* spars of weak material.

We will deal with each of these forms of temporary bridges in their order.

I. Bridges without Intermediate Supports.

When sufficiently long and strong spars can be obtained, the easiest way to construct a bridge across a gap is to put the spars across, and complete the roadway as described in the next paragraph.

General Method of Constructing Roadway on Bridges.

The general method of constructing a roadway on a bridge is that shown in Plate 88, p. 744.

The spars carrying the planks are called "road-bearers," the planks "chesses," and the light spars which hold them in their place "ribands." The "ribands" are lashed down by "rack-lashings" (at intervals of 3 feet) to the outer road-bearers.

Taking the various parts of the roadway in detail:—

(*a*) *Shore-transoms.*

The road-bearers at each end of the bridge should rest on a spar partly sunk in the ground, called a "shore-transom," which is laid at right angles to them. The object of this spar is to prevent the road-bearers sinking into the ground.

(*b*) *Road-bearers.*

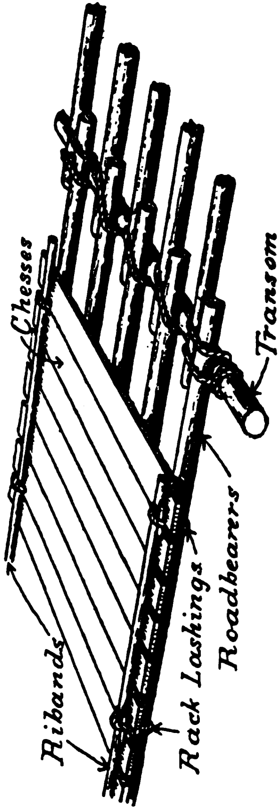
The road-bearers, usually 5 in number, should be put into position by men pushing them out one at a time from one side of the gap, assisted by men on the other side of the gap pulling on a rope fastened to them. When all the road-bearers have been placed on the shore-transoms, pickets should be driven in on each side to prevent them moving.

(*c*) *Chesses.*

The chesses should be about 1 ft. longer than the width of the bridge, and every third or fourth chess should have a notch cut in it in which the rack-lashing can be tied.

PLATE 88.

Method of Forming Roadway.


Chesses
Transom
Roadbearers
Rack Lashings
Ribands

(*d*) *Ribands.*

The ribands serve the double purpose of pressing the chesses down on the road-bearers—thus preventing them from shifting—and of acting as wheel guides.

(*e*) *Hand-rails.*

Hand-rails should always be provided, and should be made of ropes or light spars lashed or fastened to pickets driven into the ground at the ends of the bridges, and to other pickets lashed upright at intervals along the bridge. The hand-rails should be about 3–4 feet above the roadway.

To prevent animals seeing over the side of the bridge when crossing and perhaps becoming alarmed, bushes or branches of trees should be tied to the hand-rails on both sides.

II. Trestle Bridges.

General Construction.

A trestle bridge is a trestle-supported roadway, stretching from bank to bank. It can be made with one or more trestles.

Two, Three, and Four-legged Trestles.

Trestles are made of spars or timbers lashed together with rope or wire, and can be made in three forms, viz.: two, three, or four-legged.

The two-legged trestle shown in Plates 89 (p. 747) and 90 (p. 749) is the most usual form.

The three-legged, or tripod trestles shown in Plate 90, are always difficult to place in position, and are not suitable when the bottom is uneven, but they can be made of light material, and are especially useful in tidal rivers, since they admit of the easy raising or lowering of the roadway.

Four-legged trestles, as shown in Plate 90, are more troublesome to construct than two-legged, but they can be made of light material, and will stand without being braced. They are suitable for a small bridge of two bays or as steadying points in a long bridge of two-legged trestles.

Bays.

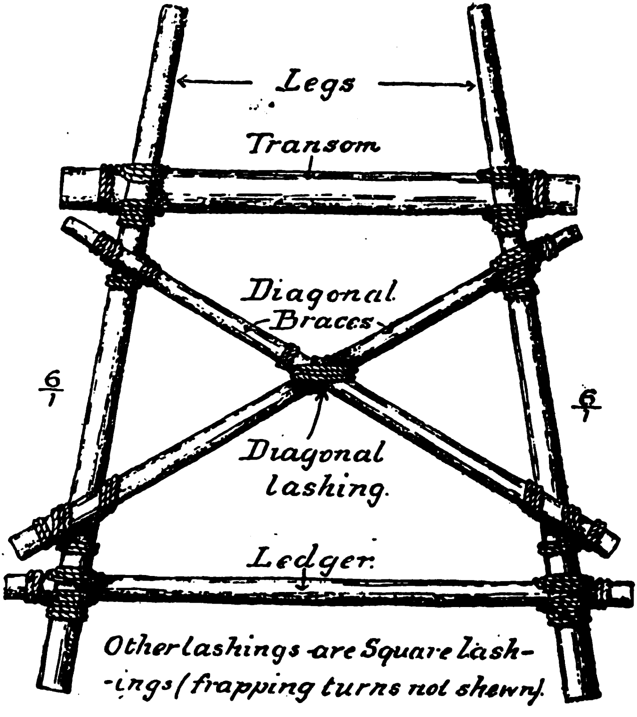
The distance between two supports of a bridge is called a "bay," and must depend on the size and length of the road-bearers available; 12–15 feet is a convenient length.

Preparation of Section of Stream or River.

Before beginning the construction of a trestle bridge, a "life-size" section of the stream or river at the point where it is to be bridged must be prepared. This point, for convenience, should be marked by a line stretched between the banks. For this purpose the width of the stream and the height of the banks must be measured and the section laid out on a level piece of ground, the level of the water being indicated in some way. The depth of the water near the proposed position for each trestle (which should as a rule not be more than 15 feet from the next) would then be ascertained, a long rod being used for the purpose. If the bottom is very irregular, it may be advisable to take a section on both sides of the proposed bridge. One leg of each trestle should then be placed in its proper position on the section, the lower end resting of course on the line which indicates the bottom of the stream. After this the height of the roadway above the foot of each leg should be marked on each leg. In order to make allowance for the fact that the legs of the trestles will not be vertical, but at a slope of $\frac{6}{1}$, one inch for every 6 feet in length must be added. Accordingly, if the roadway is to be 12 feet above the bottom of the stream, a point 12 feet 2 inches up the leg must be marked. In order to mark the position on each leg where the transom is to be lashed, the thickness of the road-bearers and chesses, say 9 inches, should be deducted from the first measurement of 12 feet 2 inches, thus making the transom 11 feet 5 inches from the bottom. If a road-bearer be laid between each two legs, a complete section of the proposed bridge will be obtained. A calculation can then easily be

PLATE 89.

Two-legged Trestle.


Legs
Transom
Diagonal Braces
6/1
6/1
Diagonal lashing.
Ledger.
Other lashings are Square lashings (frapping turns not shewn).

made of the amount of timber or other material required for the bridge.

Construction of Two-legged Trestles.

A two-legged trestle, as shown in Plate 89 (p. 747), consists of two legs sloping outwards at an inclination of $\frac{6}{1}$, a transom, a ledger, and two braces.

Before the spars are lashed, each one must be first marked at the place where it is to be lashed. When marking the transom it should be placed on the ground and its centre found, after which the places where the legs will cross it should be marked, the distance between these points being equal to the width of the roadway with 18 inches added, *i.e.* 10 feet 6 inches in the case of the normal width of roadway of 9 feet.

Ledgers.

The ledger is usually lashed about 1 foot from the bottom of the legs, parallel to the transom, but if the bottom is muddy it is better to lash two close to the ends of the legs, one on each side of the legs, so as to take the mud; conversely with a rocky bottom one is enough, and it should be high enough not to touch the bottom.

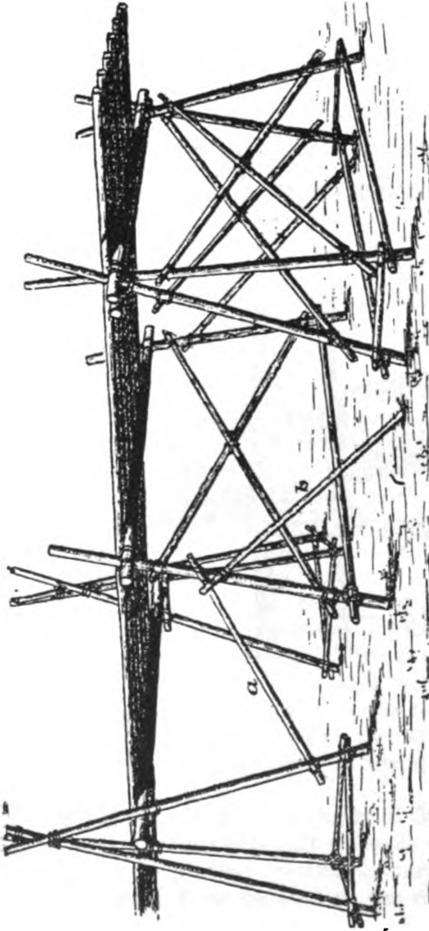
The ledger is marked in a similar manner to the transom, the distance of the marks from the centre being equal to those on the transom plus one-third the height of the transom from the ledger, thus making an allowance for the legs sloping at $\frac{6}{1}$.

The legs should then be laid on the top of the transom and ledger so that the marks cover each other, and should be lashed with square lashing (Plate 91, see p. 750).

The braces should be put on the frame with both butts and one tip on the same side, the other tip being on the opposite side.

When this has been done the frame must be squared by measuring the diagonals from the centre of the transom lashing to the centre of the ledger lashing on the opposite leg, and the frame adjusted until the diagonals are equal, after which the

PLATE 90.



4 legged trestle

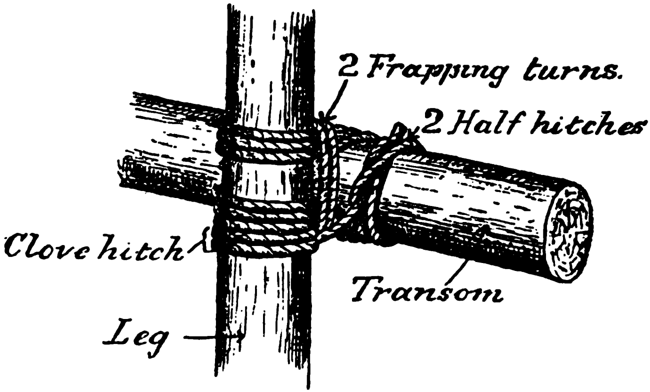
2 legged trestle

Tripod or
3 legged trestle

a. b. - Braces.

PLATE 91.

Square Lashing.


2 Frapping turns.
2 Half hitches
Clove hitch
Transom
Leg

braces can be lashed at the tips and at the point where they cross one another.

Square Lashing.

The method of lashing spars together when making a bridge, as shown in Plate 91, p. 750, is called "Square Lashing," and is carried out as follows :—

A clove-hitch is made on the leg below the transom, the rope being then passed at least three times round the two spars, the returns passing outside one another on the transom and inside on the leg. After this the rope is taken twice over the returns between the spars in what are called "frapping turns," and is finally finished off with two half-hitches on one of the two spars. Care must be taken to pull and beat all the returns, especially the frapping turns, as tight as possible.

Placing Trestles in Position.

If the water is shallow, the trestles can be carried out and placed in position by men wading in the water. But, if the water is too deep for men to wade, the trestles can either be carried on to the end of the bridge and lowered feet first down two inclined spars into their required positions, or can be taken out on rafts and then set up in position.

Plate 92 gives three alternative methods of placing a trestle in position where the water is too deep for men to wade.

Fig. 1 shows the trestle supported by a rope made fast round the seat of a boat. The boat and trestle are pushed out, by the spar attached to the trestle, to the required position and then the trestle is allowed to sink to the bottom by paying out the ropes from the boat—being kept upright by the road-bearer.

Figs. 2 and 3 show different methods of floating a trestle out to its position by means of a raft of casks or timber.

Another method of placing trestles is shown in Plate 93, and is especially useful if the current of the river is strong or

PLATE 92.

PLACING TRESTLES IN POSITION.

FIG. 1.

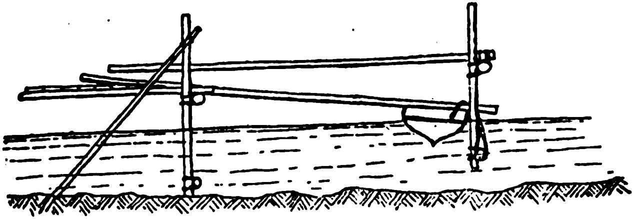


FIG. 2.

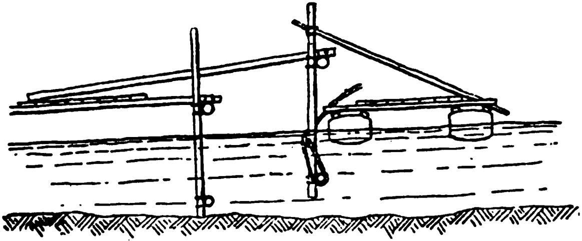
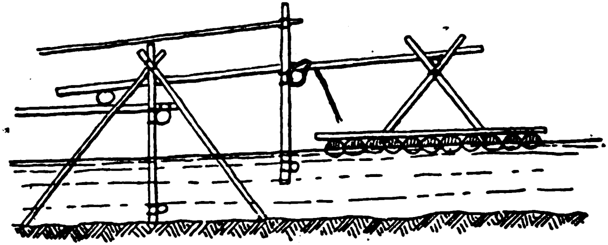


FIG. 3.



the trestles very heavy, as it ensures the trestles being in their exact positions when raised, thus obviating any movement afterwards of the trestles, which may be almost impossible. A distance frame of 4 spars, with diagonals of rope, is made and floated to the head of the bridge, as shown in Figs. 1 and 2.

The trestle to be raised is then floated and towed, or warped out, to the head of the bridge and placed as shown in Fig. 3, the tips pointing out from the bridge-head, and the bottom of the legs floating underneath the front of the distance frame.

Head guys are attached to the trestle, and two sets of foot-ropes, one of which is brought up round the front spar of the distance frame on to the bridge-head. The trestle is then raised, *vide* Fig. 4, by hauling in the head-guys and easing off the ordinary foot-ropes, the legs of the trestle pivoting about the front spar of the distance frame. When the trestle becomes vertical the foot-ropes round the front spar of the distance frames are eased off and the legs take the ground.

Where greater stability is required than is given by a trestle placed in position in one of the ways already indicated, the legs of the trestle may be driven in as piles as described on p. 762, and shown in Plate 98 (p. 763).

Bracing Trestles.

When trestles are set up in position they are kept upright by lashing the road-bearers to the transoms, as explained under "Construction of the Roadway" (p. 743), and also by lashing spars called "braces" from one trestle to the next, as shown in Plate 90 (p. 749). In the case of the trestle at either end of the bridge, spars are lashed from the tops of the legs to posts called holdfasts firmly driven into the ground. This will greatly steady them. These spars should be put on before the trestle is launched, and will be found useful in getting it into position.

Adjusting Transom.

Plate 98, Fig. 1, shows a method of adjusting the height of a

PLATE 93.

FIG. 1.

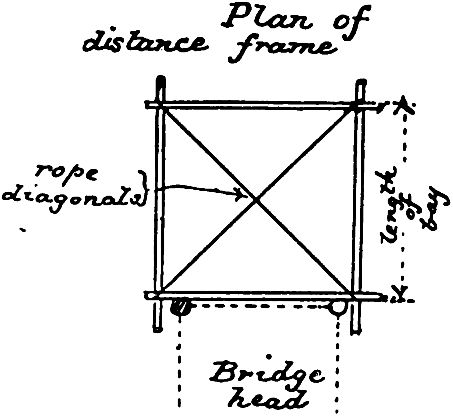

Plan of distance frame
rope diagonals
length of bay
Bridge head

FIG. 2.

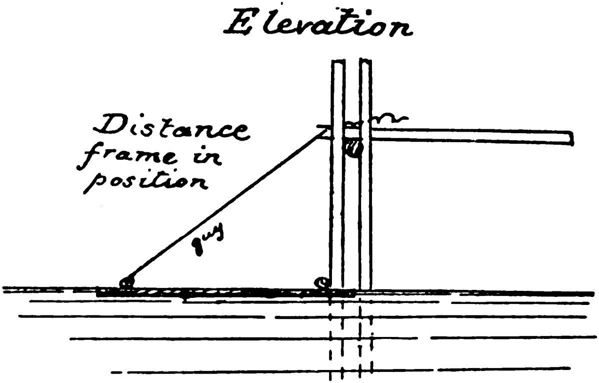

Elevation
Distance frame in position
guy

PLATE 93 (continued).

FIG. 3.

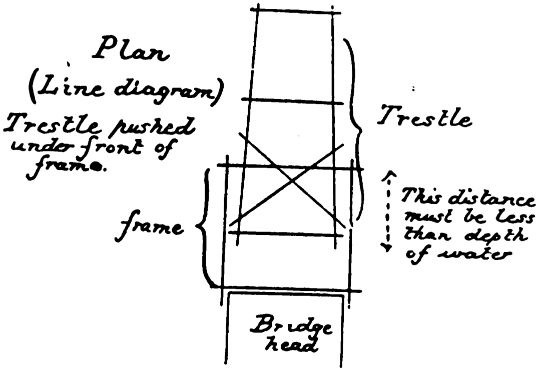
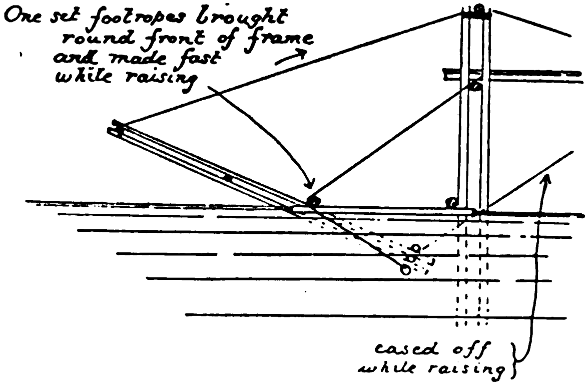

Plan
(Line diagram)
Trestle pushed under front of frame.
Trestle
frame
This distance must be less than depth of water
Bridge head

FIG. 4.


Elevation
Trestle being raised.
One set footropes brought round front of frame and made fast while raising
eased off while raising

transom after a bridge is completed, without dismantling the roadway. The square lashing of the transom on one side is undone and the transom lowered or raised by means of the lever shown, and then relashed, the weight being held up by the lever.

Guying Trestles.

If the stream is likely to exceed 3 miles an hour, guys should be attached from each trestle to the shore up-stream, or if this is not possible, to some form of anchor in the stream. A guy carried to the bank down-stream will also steady a trestle.

Construction of Roadway.

Directly each trestle is got into position the roadway to it should be constructed. The detailed method of construction is given on p. 743.

Boom across River.

If timber or any other material is likely to be washed down the river, a boom should be placed across the river at some convenient spot in order to prevent damage to the bridge.

Substitute for Trestles.

Various expedients, such as cribwork piers and brushwood gabions, can be used instead of a regular trestle.

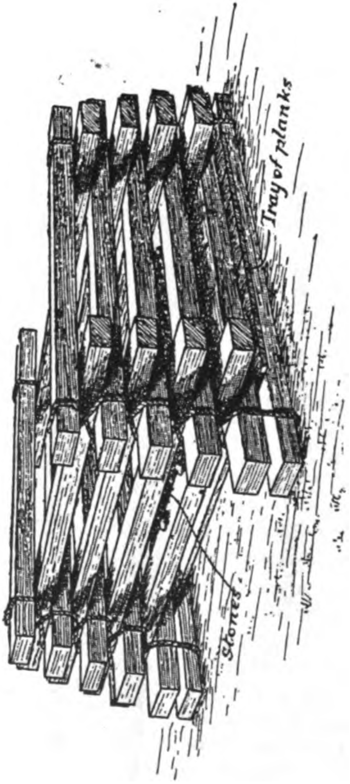
1. *Cribwork Piers.*

Cribwork piers, as shown in Plate 94, can be made with railway sleepers or other suitable timber and are very useful substitutes for trestles. They were largely used in South Africa. The timber can either be lashed together as shown in Plate 94, or can be half-jointed and nailed together; if used in rivers, a tray should be formed by nailing planks below and round the two bottom tiers of sleepers, and this should be filled with stones and the whole sunk in the proper position.

2. *Brushwood Gabions.*

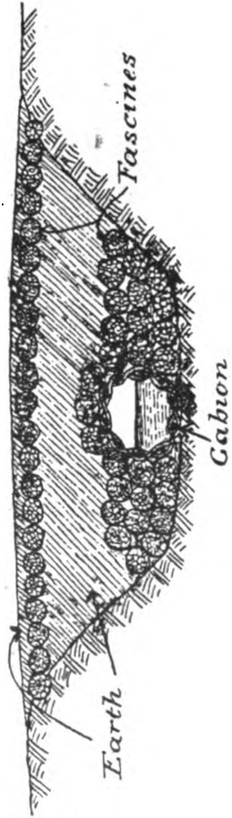
Small gaps can be bridged over by means of brushwood

PLATE 94.


Tray of planks
Stones

Cribwork Piers

PLATE 95.


Fascines
Gabion
Earth

Method of Bridging small gap

gabions or fascines, as shown in Plate 95. The intermediate space can be filled up with timber, rubble, earth, or any other material.

Light Trestle Foot-bridge.

Plate 96 shows another method of constructing a ligh bridge. It can be easily and quickly made, but it is not suitable for anything heavier than infantry, nor in a stream deeper than 3 feet 6 inches and of greater velocity than 3 miles an hour. A bridge of this kind was actually constructed during the Norwegian manœuvres in 1907, over a river about 70 feet wide in 2 hours, the spars being available close at hand. As will be seen from the plate, the supports consist of a species of trestle about 10 feet apart.

The bridge is constructed as follows :—

The legs of each trestle should consist of spars or trunks of trees, not less than 10 feet long and about 6 inches in diameter at the butts, and are placed in position by men standing in the water. The butts of the legs are placed about 3 feet apart, and, provided the bottom is soft enough, are driven well into the bed of the river, the legs being crossed and lashed together with "diagonal" lashings at a point about 5 feet from the butts. Each leg is then strutted by another spar, similar to a leg, driven into the bed of the river and lashed by "square" lashing to the head of the leg. A transom about 5 feet long and 6 inches in diameter is then lashed by a square lashing to the legs, about 2 feet above where the legs cross. The road-bearers, approximately 14 feet long and 2 feet in diameter, are now placed in position in the usual manner, three between each trestle, and lashed tightly to the transoms, after which cross pieces, about 3 feet long and 3 inches in diameter, roughly squared by an axe or adze on the under sides, are lashed or nailed to the road-bearers to act as chesses. The bridge is completed by long spars, similar to those forming the legs, being lashed by "square" lashing to the heads of the legs on

PLATE 96.

LIGHT TRESTLE FOOT-BRIDGE.

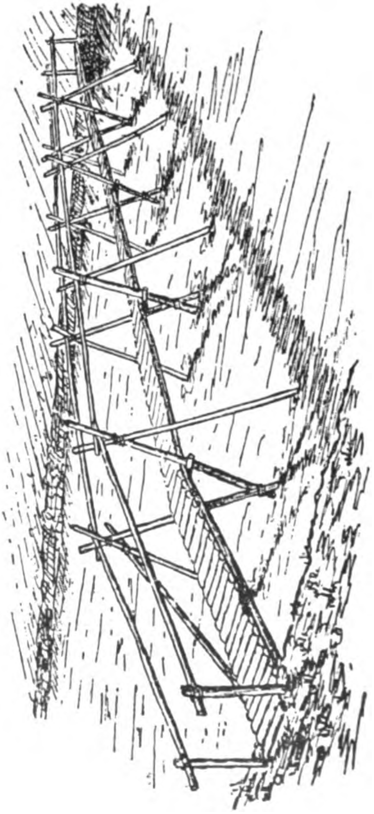
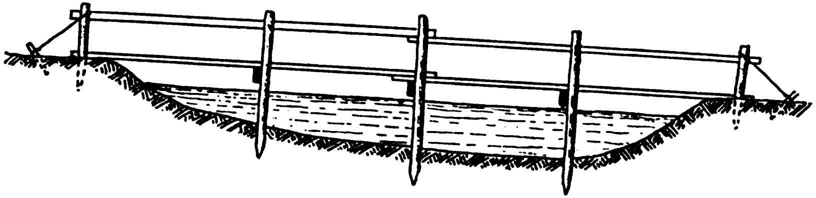


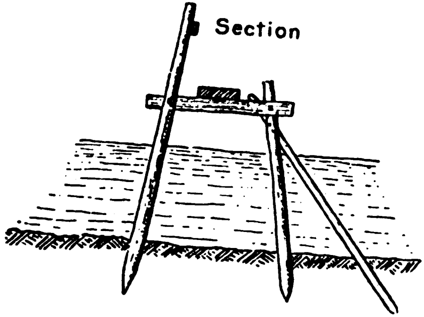
PLATE 97.

FOOT-BRIDGE FOR CROSSING SMALL STREAM OR LANDING TROOPS.

Elevation



Section



both sides of the bridge to form a handrail and also to make the trestles more secure.

A foot-bridge which is equally suitable for landing troops dry-shod out of boats or for bridging a small stream can be rapidly made as shown in Plate 97 (p. 761).

Light trestles, of the required dimensions, as shown in the Plate, are made on the banks ; each trestle consisting of 2 legs with a transom fixed by nailing or lashing to each leg. The first trestle is pushed out into position and a plank, weighed down by men on its shore end, is passed out across the transom. One man then goes out and drives in the legs of the trestle with a maul or hammer. A strut is then lashed or nailed to the shorter of the two legs. The planks placed from the shore end to the trestle act as the roadway.

III. Pile Bridges.

Different Forms.

Plate 98, Figs. 2, 3, and 4 also show different methods of constructing a roadway on piles.

Pile Driving.

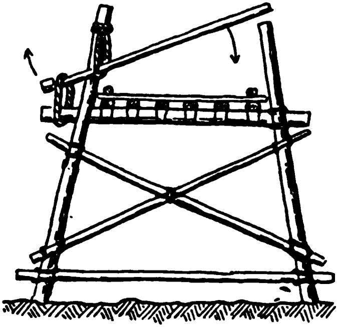
Piles can be driven either by a heavy hammer, a maul, or as follows :—

A vertical hole is bored in the centre of the head of a pile parallel to its length for about 1 foot deep and in this hole is placed an iron girdle rod, up and down which a " monkey " is worked by hand by men who stand on a platform fixed to the pile. " The monkey " is made of any heavy wood, such as oak, about 3 feet long and 10 inches in diameter, with a hole bored through the centre to allow it to slide up and down the guide rod. The monkey has 4 handles on it by which it is raised by men standing on the platform, and then allowed to drop on to the head of the pile, driving it into the ground. A good method of driving piles by hand, in which the weight of the men on the platform tells, in addition to the blows given by

PLATE 98.

PILE BRIDGES.

FIG. 1.



Method of heightening Roadway.

FIG. 2.

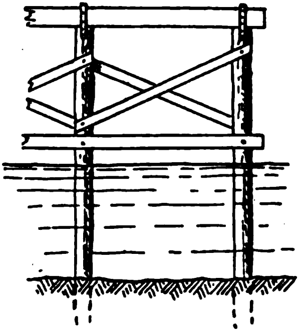


FIG. 3.

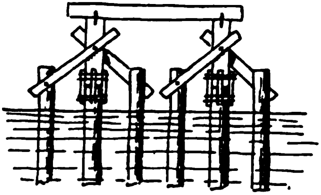
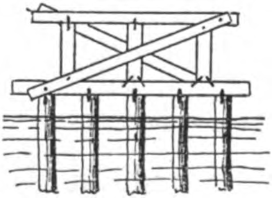


FIG. 4.



the " monkey " or maul, is to lash 2 baulks to the head of the pile, so that these incline towards the shore, and to place a plank of sufficient width to allow standing room for the men across the baulks.

IV. Single-lock Bridges.

A single-lock bridge consists of two frames which lock together, as shown in Plate 99, one frame being slightly broader than the other.

The maximum width which can be bridged by a single-lock bridge is 30 feet.

Preparation of Section.

Before beginning the construction of a single or double-lock bridge, a " life-size " section of the gap which is to be bridged must be prepared. For this purpose the width of the gap and the height of the banks above the water-line must be measured, the position of the footings marked and the section laid out on a level piece of ground near the gap. One leg of each of the frames should then be placed in its proper position on the section, the lower end of each leg being placed at the spot which marks the position of the footings, while the upper ends are placed across one another at the centre-point of the gap.

When this has been done, the places where the transoms and ledgers must be lashed should be marked and the work of constructing the trestles begun.

Construction of Frames.

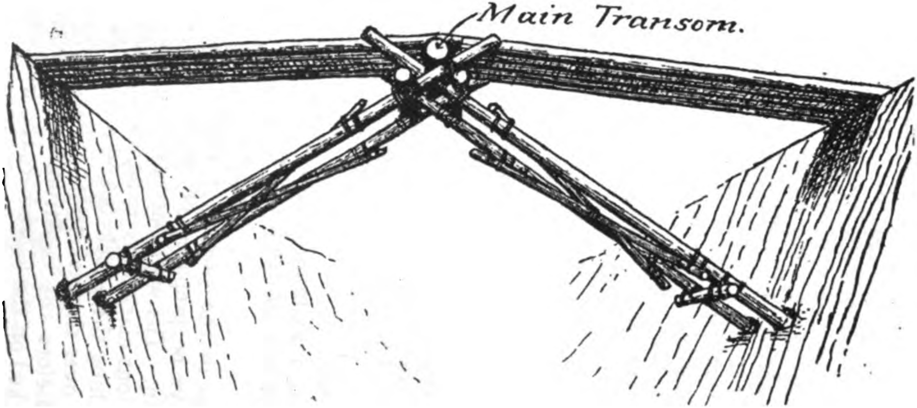
The frames are constructed in the same way as a two-legged trestle (Plate 89), except that the transom and ledger are lashed on opposite sides of the legs, the transom being on the shore side. For a normal width of roadway the breadth of a smaller frame should be 10 feet 6 inches in the clear, and of the larger 12 feet.

Placing Frames in Position.

After the footings for the legs of the frames have been cut

PLATE 99.

Single Lock Bridge.


Main Transom.

out, four holdfasts should be made on each bank by driving posts firmly into the ground, two at some distance back from the gap for the fore and back guys, and two close to the gap for the foot-ropes. A fore and back guy rope should be attached to the top of each leg of the frame, the fore guy rope being thrown across to the other bank; a foot-rope should also be attached to the foot of each leg above the ledger. The frames should then be lowered until the butts of the legs rest in the footings, after which the tops of the frames should be inclined towards one another until they lock. When this is done a main transom should be passed out and placed in the fork formed by the legs.

Construction of Roadway.

See p. 743, and Plate 88 (p. 744).

V. Double-lock Bridges.

General Construction.

A double-lock bridge, as shown in Plate 100, consists of two frames similar to those used in a single-lock bridge and of spars which form the passage way between them and are called distance pieces. The frames in this case, however, are of the same size.

The maximum width which can safely be bridged by a double-lock bridge is 45 feet.

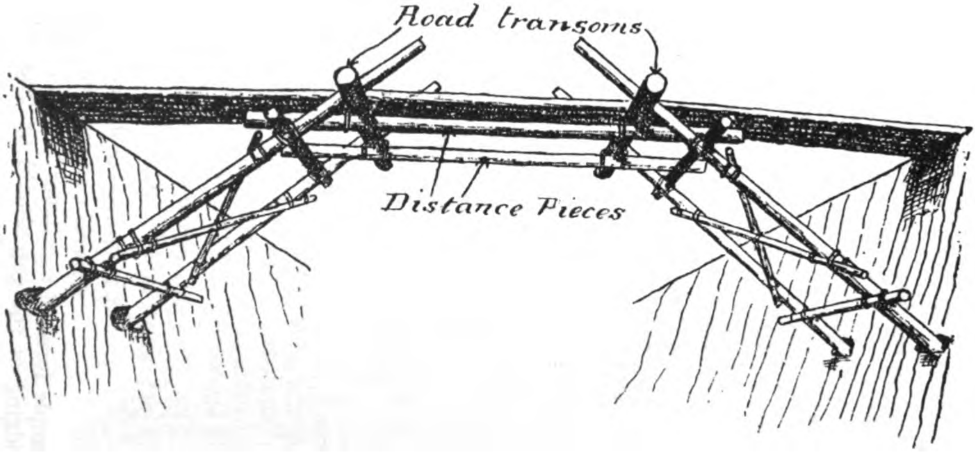
Preparation of Section.

As in the case of a single-lock bridge, a section should always be prepared before the construction of the frames is begun. The width across the gap is divided into three equal portions marked by two pickets, the tips of the legs are placed touching these pickets and a distance piece put across the legs and over the pickets.

Before the construction is begun, the places should be marked on the legs where the frame transoms are to be lashed

PLATE 100.

Double Lock Bridge.


Road transoms
Distance Pieces

to the legs, and on the distance pieces where the road transoms are to be lashed.

Construction of Frames.

The frames are constructed in the same way as a two-legged trestle (Plate 89, p. 747), except that the transom and ledger are lashed on opposite sides of the legs, the transom being on the shore side. For a normal width of roadway the breadth of each frame should be 10 feet 6 inches in the clear.

Placing Frames in Position.

After the footings for the legs of the frames have been cut out holdfasts should be made on either bank, as described under Single-Lock Bridges on p. 766. A fore and back guy rope should be attached to the top of each leg of the frames, the fore guy ropes being thrown across to the other bank and a foot-rope also attached to each leg above the ledger. The frames should then be lowered until the butts of the legs rest in the footings, after which the frames should be inclined towards one another and held in position by means of the back guys attached to the holdfasts, but in order to allow of the distance pieces being placed in position they should be kept rather more apart than was allowed for when preparing the section. The distance pieces should then be passed out and pushed across the transoms of the frames. After this has been done, two road transoms should be lashed across the distance pieces at the places previously marked, as shown in Plate 100, the back guys slackened, and the whole allowed to interlock.

Construction of Roadway.

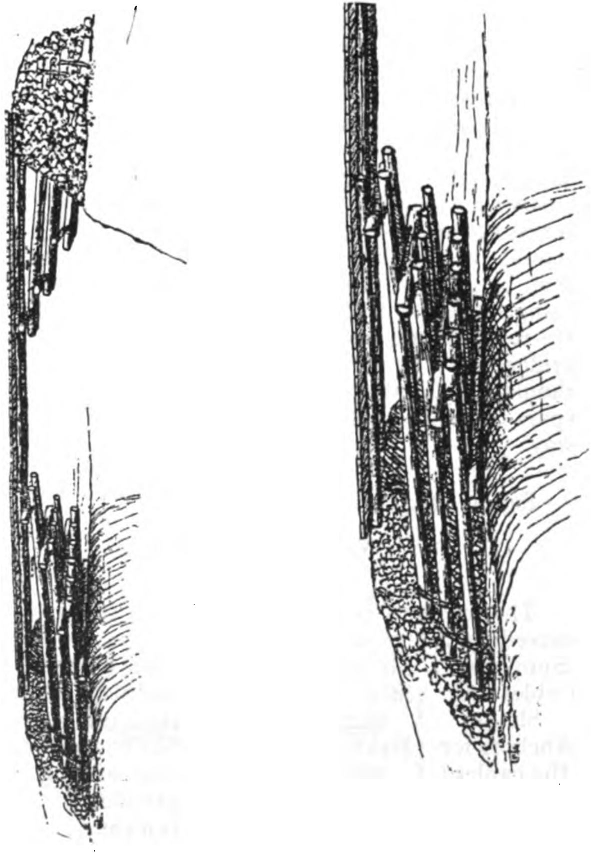
See p. 743, and Plate 88 (p. 744).

VI. Cantilever Bridges.

General Construction.

A simple form of cantilever bridge is shown in Plate 101. The bridging of the gap should be begun from both banks,

PLATE 101.



Cantilever Bridge

CANTILEVER BRIDGE.

and continued until the space between the projecting ends is so small that it can be crossed by spars.

Method of Construction.

The first spars which are laid down should project over the gap not more than one-third of their length, while the number of spars which are used must be sufficient to give a roadway 9 ft. in the clear, that is to say, should be some 10 ft. 6 in. broad. The two-thirds of each of the spars which rest on the bank should be covered with planks or other material placed crosswise and weighted with stones, a transom being lashed across the projecting ends on both sides. Another row of spars should then be laid on the top of this. These spars should then be covered with planks and stones as before, a transom being lashed on the projecting ends, and another row laid on the top of them, and so on, until the intervening space can be bridged by a single row of spars as road-bearers. A transom should be lashed across the projecting ends of the top row of spars on both sides and the roadway completed in the usual way.

Construction of Roadway.

See p. 743, and Plate 88 (p. 744).

VII. Suspension Bridges.

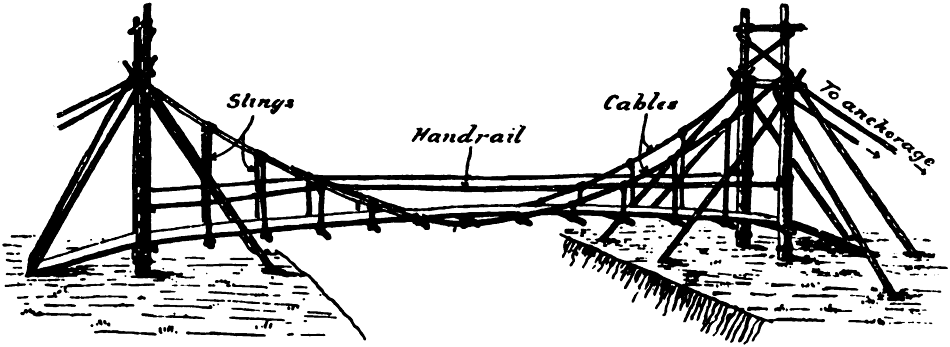
Material.

The material required for a simple suspension bridge not exceeding 200 ft. in length is as follows:—

Supports:	Strong timber, iron posts, or trees.
Cables and Slings:	Steel chains, steel or ordinary hemp rope, or old telegraph wire twisted into ropes.
Anchors for the cables:	Heavy spaces or baulks of timber buried in the ground, or in the case of long bridges buried in concrete in the ground.
Roadway:	Timber as in trestle-bridges,

PLATE 102

Suspension Footbridge


Slings
Handrail
Cables
To anchorage →

General Construction.

This form of bridge, requiring as it does a certain amount of technical knowledge as well as skilled labour, is beyond the scope of the present work, but Plate 102 has been prepared to show the general form.

Rope Bridge.

Another most simple form of suspension bridge is the rope bridge shown in Plate 103, Fig. 1, which is in general use among the natives of Northern India.

This bridge consists of three ropes stretched across the gap ; a man, when crossing, walks on the bottom rope and holds on to the other two, which are about three feet higher than the first and about three feet apart ; the ropes are kept in position by being lashed to forked branches of trees or to two spars lashed together in the form of a V. The best method of forming the supports on either edge of the gap is that shown in Plate 103, Fig. 2. In this case the cross spars are lashed together in the middle at the point where they cross, and a light ledger is lashed across their feet, the lower half of the spars being buried in the ground.

The anchorage for the ropes at each end consists of a stout tree-trunk or spar, about 12 inches in diameter, buried some 5 feet deep in the ground at a point about 10 feet away from the end supports, as shown in Fig. 3.

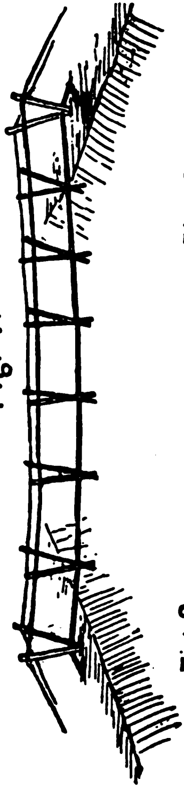
Extemporised Foot-Bridges.

Plates 104 and 105 show various methods of extemporising a footbridge.

Ladder, Wagon, and Floating Log Bridges.

In Plate 104, Fig. 1 the roadway of planks, which is about 3 feet broad, supported on two rows of ladders, each row consisting of two ladders lashed together ; it is strengthened by a spar placed below the junction of the ladders, supported by the rods of iron, steelwire, or rope.

PLATE 103.



Rope Bridge
Fig. 1.

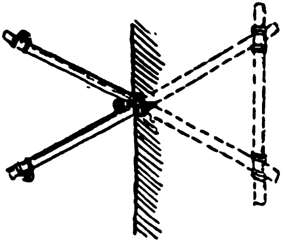


Fig. 2.
End Frame.

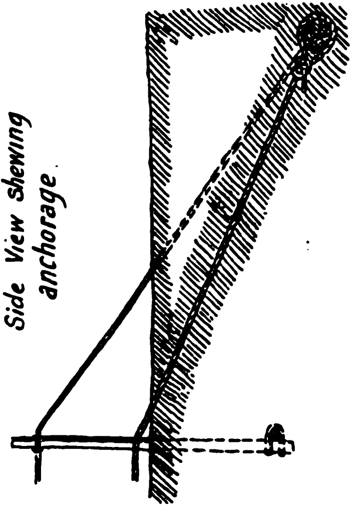


Fig 3
Side View shewing anchorage.

PLATE 104.

LADDER BRIDGES.

FIG. 1.

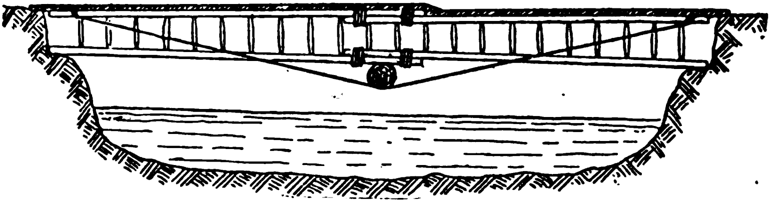


FIG. 2.

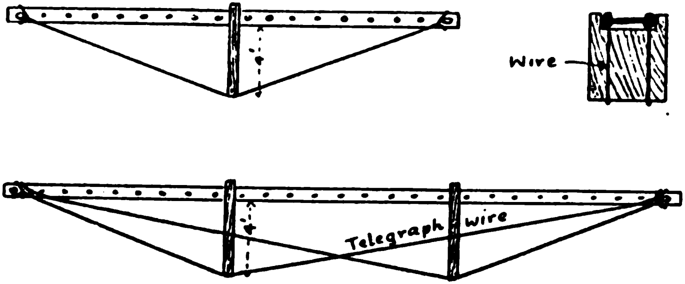

Wire
Telegraph wire

PLATE 105.

WAGON AND LOG BRIDGES.

FIG. 1.

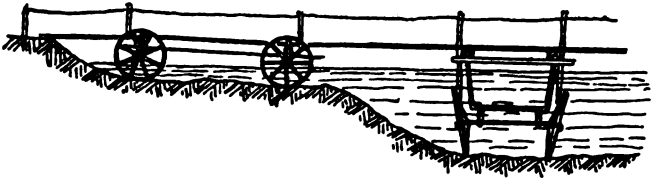


FIG. 2.

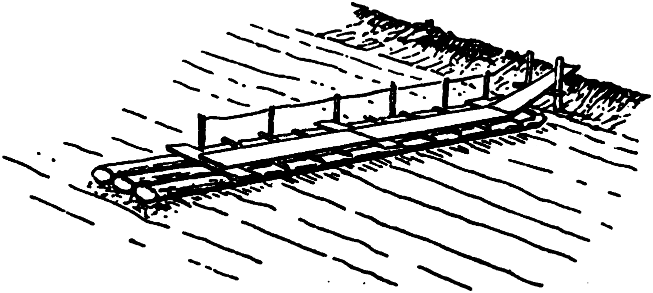


Fig 2, shows a method of using trussed ladders for gaps up to 40 or 50 feet.

A strut consisting of a plank as wide as the ladder is supported by telegraph wire fixed to the ends of the ladder.

For long ladders two struts should be used. The wire should be fixed to the sides of the ladders and not to the rungs.

Plate 105 shows two other methods of extemporising a foot-bridge.

Fig. 1 shows a wagon bridge, the central support for the roadway consisting of a wagon placed in the middle of the stream parallel to the banks, the road-bearers resting partly on the sides of the wagon, but also on spars supported on a transom which is held up by vertical spars lashed to it and to the wheels of the wagon. A stronger form of this bridge, but one which would take longer to make, can be devised by removing the body of the wagon and building up a central support resting directly on the axles of the wheels. This central support would bear a greater weight than the sides of the wagon.

Fig. 2 shows a foot-bridge made out of tree trunks floating in the water and carrying a roadway of planks, with cross planks and spars under them.

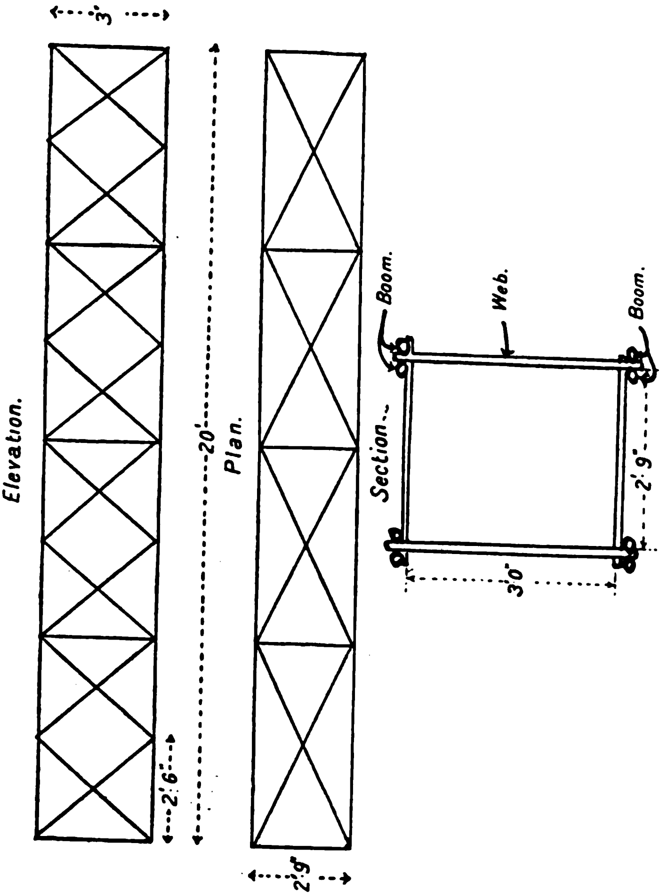
Brushwood Girder Bridge.

An extemporary bridge to carry infantry in file can be constructed entirely of brushwood, up to a span of 20 to 30 feet.

Road-bearers.

The road-bearers consist of two lattice-work girders, *vide* Plate 106. Each boom consists of two horizontal rods laid side by side. The diagonal and vertical struts and ties, composing the webs of the girders, are single rods. The ends of these diagonal and vertical rods are placed between the two rods forming the boom and the whole tightly lashed together with wire. The diagonals are lashed together at the point where they cross one another.

PLATE 106.


Elevation.
3'
2'6"
20'
Plan.
2'9"
Section.
Boom.
Web.
Boom.
2'9"
3'0"

After completing the two girders, they are braced together at intervals of 5 feet with horizontal and diagonal rods, lashed to the inner sides of the booms.

Roadway.

The roadway is formed by placing hurdles on the upper booms and lashed to them.

This bridge can be placed in position by 4 men.

Transoms.

The girders should rest on flat spars, transoms, placed at 10 feet intervals.

Material.

Brushwood up to about 1½ inches diameter is most suitable, but smaller can be used.

Lashing.

Before putting on the wire-lashings, the rods should be barked and slightly notched at the point of lashing, otherwise the lashings will give through the bark stripping. The best method of lashing is to take two complete turns and finish off by hoisting the ends together, continuing in this way until there are eight complete turns at each point of lashing.

Lattice Girder Bridge.

This bridge, which is shown in Plate 107, can be made of good wood, about 5 feet long and not less than 4 inches in diameter.

The girders can be about 20 feet long and, after taking a certain sag, are strong enough to carry infantry in file.

The lashings can be made of spun yarn, wire or rope.

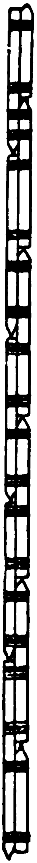
Aerial Ropeways.

Occasions when Used.

Aerial ropeways have occasionally been used with much success on service for various purposes, for instance, for transporting men across a stream, where no other means were avail-

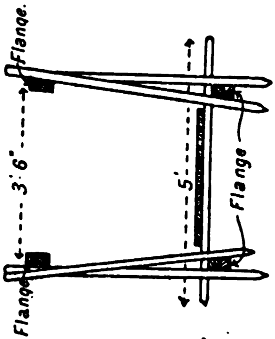
PLATE 107.

Fig. 1.



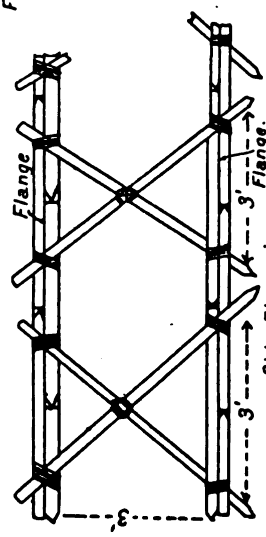
Top and Bottom Flanges.

Fig. 3.


Flange.
3' 6"
Flange.
5'
Flange

End View.

Fig. 2.


Flange
Flange.
3'
3'
3'

Side Elevation.

able, for conveying ammunition—especially the heavy ammunition used by siege artillery—up a hill too steep for a railway, and carrying rifle ammunition, food and water, to a force posted on a steep hill, as well as for transporting material from the banks to the head of a bridge during construction, etc.

Systems.

There are various systems of aerial ropeways, but they may be roughly divided into two classes, viz. :—

1. Those in which the rope is fixed ;
2. Those in which an endless running rope is used.

In the first the cradles or carriers, in which the material is transported, hang on a fixed rope, which acts as a rail, as shown in Plate 108, and are pulled along by another rope. This system, which is the same as that used in the rocket life-saving apparatus, is suitable for long spans, steep hills, and for heavy loads up to about 15 tons, but although it is simpler to make and requires less special material, which may possibly not be easy to obtain on active service, it is not so suitable as an endless running rope for continuous light loads.

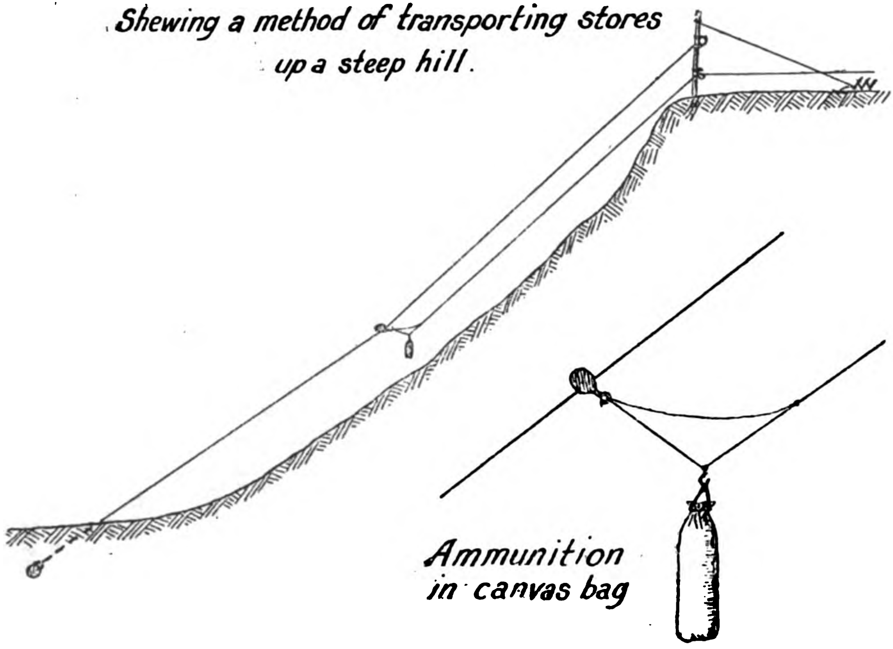
With a running rope the carriers or cradles are fixed to and hang from the rope and move with it. The carriers can either be actually fixed on to the rope, or hang from it through frictional contact. A fixed carrier is suitable for continuous light loads of about 2 cwt. up steep inclines ; the running rope for heavier loads, probably up to about 8–10 cwt., but special friction clutches will be required.

In both methods there is a wheel at one end over which the rope passes, this wheel being arranged with gear so as to be worked by manual or horse power. At the other end the rope passes over a similar wheel, to which a spring or weight is attached, so as to keep a constant tension on the rope. If the span is long, the rope is held up by passing it over pulleys fixed on trestles.

PLATE 108.

Aerial Ropeway.

Shewing a method of transporting stores up a steep hill.



Ammunition in canvas bag

VIII. Floating Bridges.

General Construction.

Bridges can be made entirely of floating material or partly of floating material and partly of trestles.

The floating portion of a bridge can be constructed out of any material, such as pontoons, boats, casks, rafts, timber, inflated skins, etc., provided it has the required buoyancy. One form of floating bridge is shown in Plate 109 (p. 783).

Buoyancy.

Each pier must have sufficient buoyancy to bear the greatest load that can be brought on to one bay of the bridge. Except in the case of a bridge required to carry heavy field artillery, infantry in fours at a check constitute the greatest weight which can be brought on any bay, that is to say 560 lbs. (5 cwt.) per foot run, and sufficient buoyancy to carry that weight must therefore be provided. It is obvious that the greater the length of bay the greater must be the buoyancy of the piers.

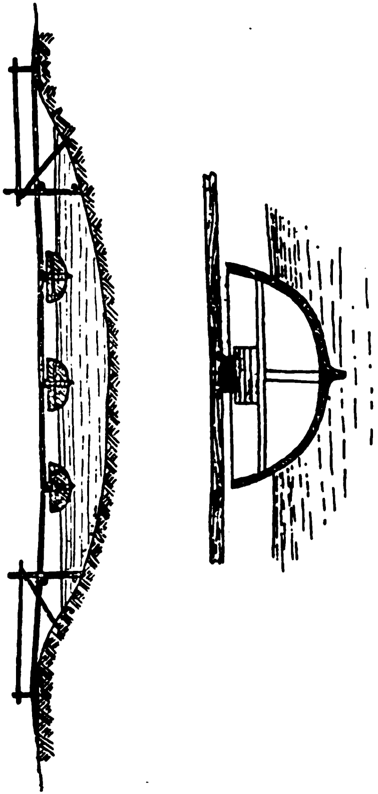
To take a concrete example: the proposed length of a bay is, say, 15 feet. The greatest weight which can be brought on it by infantry in fours is 15 × 560 = 8400 lbs. Consequently each pier must have sufficient buoyancy to carry 8400 lbs.

The following are some of the methods of ascertaining the buoyancy of those kinds of floating material which are most commonly used.

a. Buoyancy of Boats.

A rough method of finding the buoyancy of a boat is to fill it with unarmed men until the gunwale is within one foot of the water and multiply the number of men by 160. The result will give the available buoyancy in pounds; 160 lbs. being taken as the average weight of a man.

PLATE 109.



Floating Bridge.

b. Buoyancy of Casks.

(1) When the capacity of a cask is known :—

Multiply the capacity in gallons by 10, and $\frac{9}{10}$ths of this will give the safe buoyancy in pounds.

(2) When the capacity is not known :—

Safe buoyancy = $\frac{9}{10}(5C^2L - W)$ lbs.

where C = circumference of cask in feet, half way between the bung and the extreme end ;
L = length of cask in feet measured along a stave ;
W = weight of cask in pounds.

For instance :—

Circumference of cask half way between bung and extreme end	= 5 ft.
Length along a stave	= 4 ft.
Weight	= 30 lbs.
Safe buoyancy = $\frac{9}{10}(5 \times 5^2 \times 4 - 30)$	= 423 lbs.

c. Buoyancy of Timber.

The buoyancy of a log can be obtained by multiplying its cubic contents in feet by the difference between its weight per cubic foot and that of a cubic foot of water, *i.e.* $62\frac{1}{2}$ lbs., and taking $\frac{5}{6}$ths of the result.

For instance : if an unsquared beech log is three inches in diameter at one end and two inches in diameter at the other end and 24 feet long :—

To find its cubic contents the formula to be used is :—

$$\frac{L}{4}(D^2 + Dd + d^2) ;$$

where L = length of log in feet.
Dd = diameter at ends.

The calculation therefore is :—

$\frac{24}{4}(3^2 + [3 \times 2] + 2^2)$ cub. ft. = 114 cub. ft.

Now to find its buoyancy multiply its cubic contents (114 cub. ft) by the difference between its weight per cub. foot (43 lbs. as shown in table below) and that of a cub. foot of water (62½ lbs.)

The calculation therefore is :—

$$114 \times (62\tfrac{1}{2} - 43) \text{ lbs.} = 2{,}223 \text{ lbs.}$$

As, however, timber absorbs a great deal of water, only ⅚ths of this amount can be safely relied on. The available buoyancy therefore will be 1,852 lbs.

The following are given in the "Manual of Military Engineering" as the approximate weights per cubic foot of different kinds of timber :—

Ash, English	46 lbs.	Pine	40 lbs.
Beech	43 ,,	Poplar ..	27 ,,
Chestnut ..	41 ,,	Sycamore ..	36 ,,
Elm	37 ,,	Teak, Indian	51 ,,
Fir	33 ,,	Teak, African	61 ,,
Larch	33 ,,	Yew	41 ,,
Maple	32 ,,	Walnut ..	38 ,,
Oak, English ..	57 ,,	Blue Gum ..	63 ,,
Willow	25 lbs.		

A gallon of water weighs 10 lbs., while a cubic foot of water is equal to 6¼ gallons.

Length of Piers.

For the sake of steadiness the length of the piers should be at least twice the length of the roadway.

Waterway.

The waterway between the piers should be at least as much as the width of the piers. Bays are seldom more than fifteen feet long.

Preparation of Boats.

Boats have to be specially prepared, since it is not advisable to rest the road-bearers directly on the gunwales. A transom should accordingly be placed centrally along the boat resting on the thwarts, and supported underneath so that the weight is brought directly on to the keel as shown in Plate 109, Fig. 2. If one boat has not enough buoyancy for a pier or is not sufficiently long, two can be lashed stern to stern. In this case it is better to have one transom running from end to end of the two boats.

Timber Rafts.

If the rafts are to be in use for even two or three days, all timber should if possible be tarred before it is put in, particularly at the ends.

Provision for Shore Ends of Bridges—Grounding.

If the river is tidal or is very shallow near the banks, provision will probably have to be made for the shore ends grounding. If boats are used, legs should be constructed so that immediately the boats take the ground the legs will keep them upright. Casks will, however, usually be found more suitable for the shore ends of bridges which are likely to ground, as they are not so liable to be crushed.

Anchoring Floating Material.

Every alternate pier should be anchored on the up and down-stream side. If anchors are not available, the cables must be attached either to the shore, which is only possible in the case of a short bridge, or to some heavy material thrown into the stream. If the stream is likely to exceed three miles an hour, extra anchors must be laid down.

Construction of Roadway.

See p. 743, and Plate 88 (p. 744).

Boom across River.

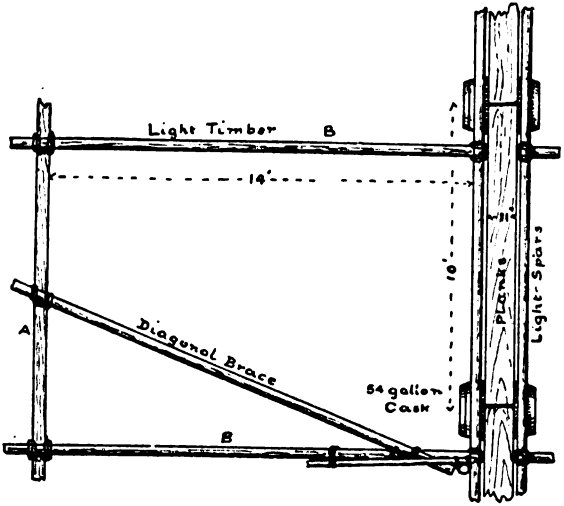
See p. 756.

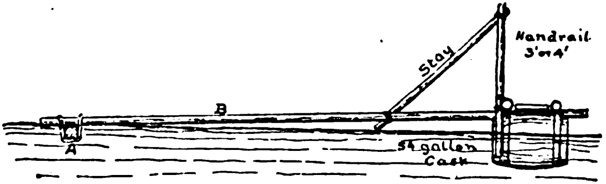
Light Bridge made with Casks.

Plate 110 shows a light foot-bridge made of single planks laid on 54-gallon casks at 10 feet intervals, kept in position by

PLATE 110.

CASK BRIDGE.


Light Timber
B
14'
11"
10'
Planks
Light Spars
A
Diagonal Brace
54 gallon Cask
B


Stay
Handrail 3' or 4'
B
A
54 gallon Cask

light spars. The whole is prevented from capsizing by arms B, supporting timbers A, which float on the surface. This will bear men at 2 paces interval.

An improvement on this bridge is shown on Plate 110, and answers all requirements for converting a small number of casks, planks, and small spars into a footbridge to carry infantry in file.

This bridge, although taking more material to construct than the one above, has the advantages of (1) a double track, allowing traffic in both directions at once if desired; (2) more stability; and (3) of allowing animals being easily swum across a river alongside one track, while the harness, etc., are simultaneously carried across on the other.

Flying Bridges.

Materials used for Construction of Rafts.

Rafts can be made of various materials, of which a few may be mentioned :—Logs of wood, bundles of brushwood, casks, lances tied together, waterproof kit-bags, or tarpaulins filled with straw, blown-out water skins, or air bags, cooking kettles, biscuit tins or similar vessels, which should be placed mouth downwards.

RAFTS.

Raft made with Casks and Spars.

Plate 111 shows a method of constructing a raft, on which one man can row, out of a 54-gal. cask and spars. The long spars act as an outrigger and prevent the cask from upsetting.

Box Rafts.

A boat or raft can be rapidly made, as shown in Plate 112, consisting of 6 planks nailed together, with a tarpaulin lashed on outside to the uprights, as shown in Plate 113, and a few boards placed on the bottom of the boat.

Plate 113 shows a method of improvising a raft by means of a tarpaulin. Make a square frame with spars 18 feet long

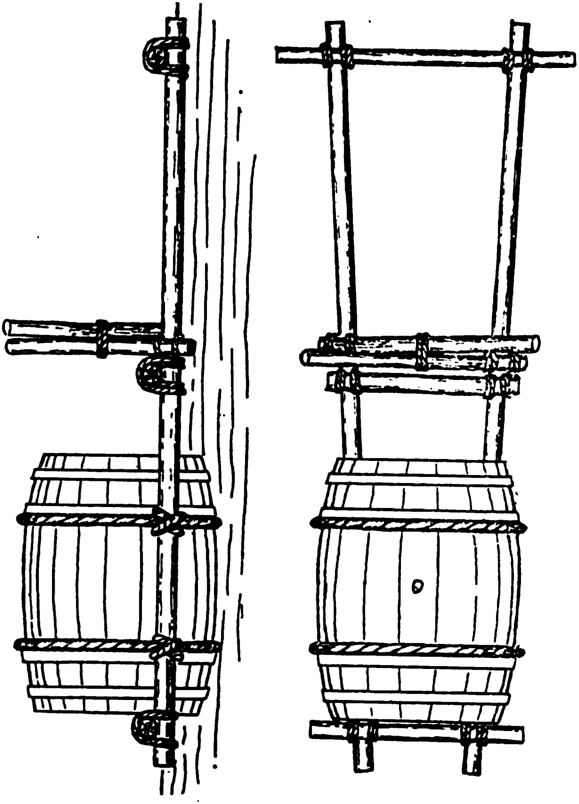


PLATE 111.

CASK AND SPAR RAFT.

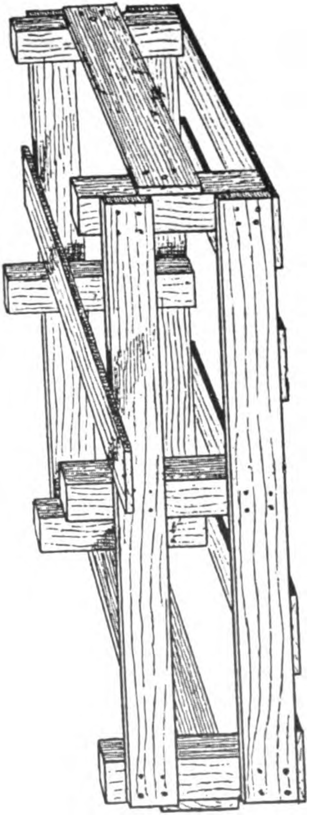
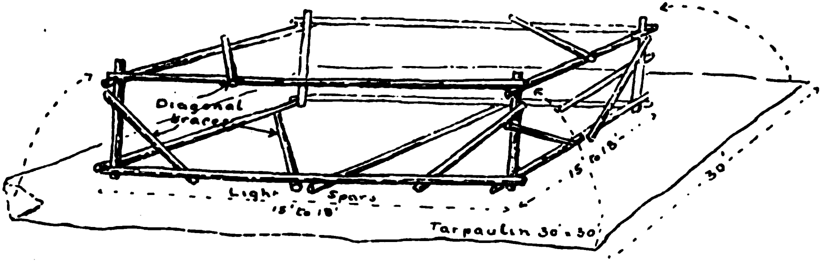


PLATE 112.

BOX AND TARPAULIN RAFT.

PLATE 113.

SPAR AND TARPAULIN RAFT.


Diagonal braces
Light Spars 15' to 18'
15' to 18'
30'
Tarpaulin 30' x 30'

The Author is indebted to the Officers of the 3rd Field Troop R.E. for Plates 110, 112–116, and 118, which appeared in the "Cavalry Journal," and for the information with regard to them.

and place it on a tarpaulin, the ends of which are brought over the frame. A few planks should be lashed down on the bottom of the frame to form a floor.

Raft of Canvas Troughs.

Plate 114 shows a method of improvising a raft by using canvas troughs. Fill two of the 600-gallon canvas troughs with empty boxes. Lace the boxes into the troughs, then join these up with a few light spars as in Plate 114. This raft will carry 16 men with their saddles. Six men should make a raft like this in 1½ hours.

Another way is to fill the troughs tightly with straw and lace them up, with 2 or 3 light poles running the length of the troughs to stiffen them.

Method of Floating a Wagon.

Plate 115 shows a method of floating a wagon on barrels.

With six 54-gallon casks, a load of half a ton can be carried. The spars are lashed to the wagon and then the casks lashed on to the spars.

Raft of Dixies and Lances.

Plate 116 (p. 795) shows a raft made of dixies and lances. The lids are first secured by spun yarn or wire, and eight of them—bottom up—are then lashed to a couple of lances, forming a pier; four of these piers are lashed to 3 spars at right angles to them and the whole made rigid by wire diagonals. A few planks are placed on top at right angles to the spars. This raft will carry about 500 lbs. and takes 8 men about two hours to make.

Methods of Ferrying a Raft across a Stream.

The simplest methods of ferrying a raft across a stream are by rowing or punting, or by ropes stretched across from bank to bank, by means of which the raft can be hauled backwards

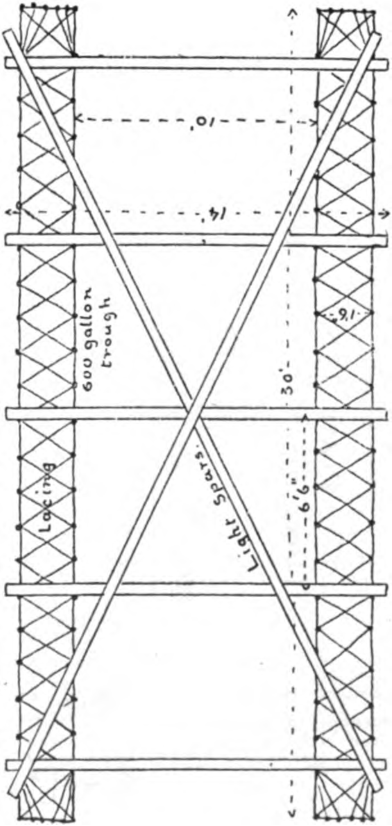

10'
14'
600 gallon trough
1' 6"
30'
Lacing
Light Spars
6' 6"

PLATE 114.

CANVAS TROUGH RAFT.

PLATE 115.

WAGON FLOATED ON BARRELS.

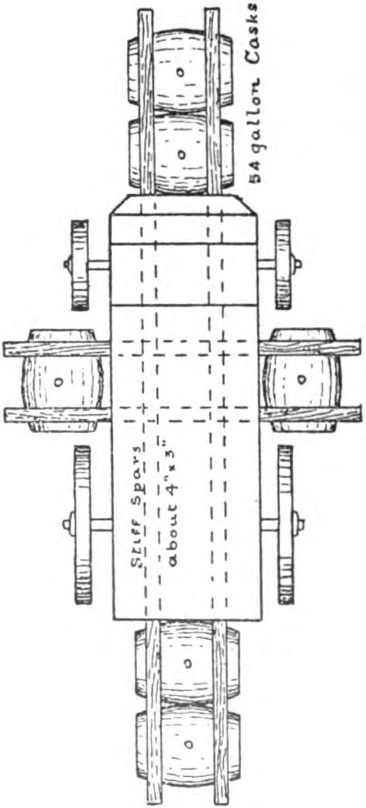
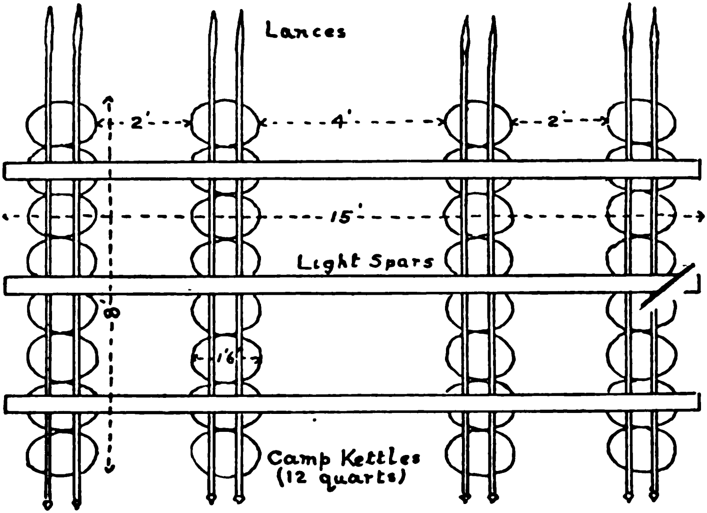

54 gallon Casks
Stiff Spars
about 4"x3"

PLATE 116.

RAFT CONSTRUCTED OF DIXIES AND LANCES.


Lances
2'
4'
2'
15'
Light Spars
8'
1'6"
Camp Kettles
(12 quarts)

or forwards. Another method is to construct a "flying" bridge if the current is fairly rapid and regular. By means of this the boat or raft is moved across the stream by the action of the current acting obliquely against its side, which should be kept at about an angle of 55° to the current.

1. *With the Cables attached to the Banks.*

In this method a raft and two cables are used; one cable being secured on each bank to a tree or stake at a point above the place at which it is desired to cross, as shown on Plate 117, Fig. 1 (p. 797). In order to get across, the cable from the opposite bank is attached to the raft, so that the raft is kept at about an angle of 55° to the current. The raft is then pushed out into the stream, and the force of the current takes it across. The cable is then detached and hauled back to the opposite bank by a light line. To re-cross, the raft is hauled up to the pier, a little above that one at which it landed, and is then attached, as before, to the cable secured on the opposite bank, then pushed out into the stream, and the current takes it across. The process is then repeated.

This method requires one raft and two cables, but if wheeled transport is to be ferried across, two piers on each bank are also necessary.

2. *With the Cable attached in Mid-Stream.*

In the second method a raft is attached to a cable, the other end of which is secured to a boat or raft anchored in mid-stream, as shown on Plate 117, Fig. 2 (p. 797). The raft is then pushed out from the bank, the current carrying it across to a point immediately opposite.

To re-cross, the raft must be placed at the correct angle to the current, and again pushed out into the stream.

In this method one cable and two piers only are required.

Cables.

In both methods the length of the cable should be from one

PLATE 117.

FLYING BRIDGES.

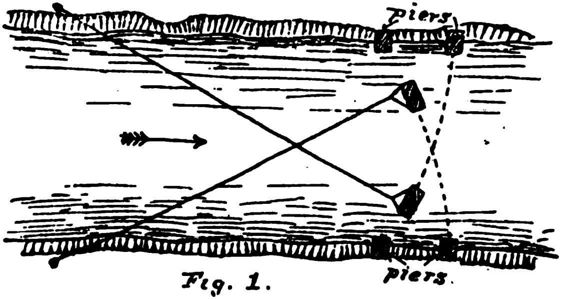
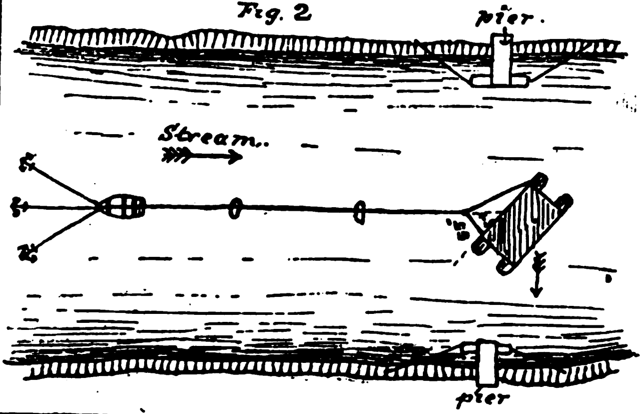

piers
piers.

Fig. 1.

Fig. 2


pier.
Stream..
pier

and a half to twice the width of the river, and should be supported on floats of some description to prevent it dragging in the water.

A good cable can be made with telegraph wire buoyed up on meat or biscuit tins.

INDIA.

Extemporised Rafts.

The following forms of extemporised rafts have all been successfully used in India. In rough water the best rafts are (*c*), (*d*), and (*a*), given below in that order of merit. In rough water it is essential to brace the two piers of a raft by diagonal poles or bamboos.

(*a*) *Kerosene Oil Tins.*

Two piers, each of twenty tins, make a good raft for 6 men. Two piers with 180 tins in each, will carry a field gun and limber with 10 men. The tins in a pier are put together into a framework or a crate of bamboos or wood, with a superstructure of poles and planks, doors, or hurdles, etc., on top. The safe buoyancy of a tin is about 36 lbs.

(*b*) *Ghurras.*

"Ghurras" or common spherical earthen vessels, about 1′ diameter, have a safe buoyancy of about 24 lbs. A raft of two piers of 20 "ghurras" each will carry four men.

The "ghurras" should be placed mouth downwards, as then the mouths need not be covered over; they are tied into a crate of bamboos, etc. The disadvantage of them is that they are fragile, and do not stand grounding.

(*c*) *Inflated Skins or "Mussaks."*

Bullock skins, being large, are best. The safe buoyancy of an average one is about 400 lbs., while 4 of them make a good raft for 6 men. Goat skins are rather small, but their buoyancy is about 75 lbs. They should be placed in a double layer, about 20 to a raft.

Skins need re-inflating frequently, which can be done by blowing with the mouth into a leg and tying it up again.

Rafts of large skins are very good for rough water and rivers in flood, and withstand even bumping on rocks.

(*d*) *Canvas Sheets or Tarpaulins.*

These should be stuffed with any sort of dried grass or even "bhoosa." The sheets must be as large as possible, and have no tears or holes in them, and should be soaked in water before use. They are improved by smearing over with clay, paint, or tar.

Each sheet is filled with the grass so as to form a rough mattress, with the opening on the top, and is then laced up. For rough water the opening must be covered over with cloth, or some other material. A sheet 18′ × 12′ forms a mattress 9′ × 5′ × 2′, and will carry an A. T. cart with 3 men. It is, however, better to lash two such mattresses side by side, as they are more stable in the water. Two will carry an 18-pr. field gun. For guns, planks, etc., must be laid on top to distribute the weight.

Tarpaulins can also be made into punts by stretching them over a framework of bamboos or sticks; but for work where they are likely to ground or bump on rocks, it is better to use them as mattresses.

The canvas covers "suleetahs" of 160 lbs. G.S. tents make good punts, stretched on a framework 8′ long by 18″ by 16″.

(*e*) *Rushes and Reeds.*

Certain kinds of rushes and reeds are very buoyant, and do not become waterlogged; they can thus, when fresh cut, be made into rafts without any covering material over them. Most of the common grasses are useless; the two best to use are the flat, dark green rush or "flag," about 12′ high, known to the natives of Northern India as "patera" (the *Typha latifolia*), and the dark green round reed, about 4′ high, known to natives as "tukla" (the *Cyperus alterifolius*). Both grow in shallow water, and are common in swamps and "jhils." A convenient method of making a raft is to bind the rushes up into bundles 10′ long by 2′ diam. with four ties of wire, etc., spaced along the length. The safe buoyancy of a bundle when the reeds are freshly cut is about 750 lbs. Two such bundles lashed together make a convenient raft for 4 men; 5 bundles will carry a loaded bullock cart.

For sluggish creeks, or streams with a current not exceeding 1½ miles an hour, a bridge to carry infantry in fours and pack animals, can be quickly made with very little material by simply laying bundles, bound as previously explained, side by side right across the stream, tying them together; and also tying them to two 3″ hemp ropes stretched across the stream, and anchored at both ends over each end of the bundles. No water-way is left, nor is any roadway placed on top of the bundles—the bundles forming a continuous mattress 10′ wide across the river.

Crossing Rivers by Swimming and Fording.

Methods of Crossing a River.

It is generally impossible to get enough material to form a raft large enough to carry cavalry quickly over a river; therefore other methods must be employed.

(*a*) The men can swim and guide their horses over, arrangements being made to get the men's kits across dry.

(*b*) A few horses can be led by men on boats or rafts, the rest being driven after them and made to follow.

Before horses enter the water, the reins should be knotted close to the horses' necks, and a lock of the mane pulled through the knots to prevent the reins slipping over their heads and getting entangled with their fore legs. Except in peace or when there is ample time, it is better to leave the saddlery on the horses.

Some of the horses should be ridden into the water until out of their depth, when the riders should slip off on the down-stream side, and hold on by the mane, or preferably by the head-rope, where it is looped round the neck, guiding the horses by pulling on either rein, and at the same time taking care to keep clear if they rear. The other horses should be driven into the water with them.

If horses are obstinate about entering the water or swimming, they should be led across with steady horses, or behind a boat or raft, which should, if possible, be towed.

In order to do this, a rope is passed round the upper part of a horse's neck and tied so that it will not slip, but only just tight enough to prevent it coming over the horse's head. The horse is then drawn into the water, and once afloat he will follow the boat or raft. Great care must be taken not to pull on the rope, or the horse's nostrils will be pulled under the water and he will be drowned. The rope should be long, and the boat rowed very slowly. Four horses can be taken across at once. Horses can also be led by men walking on a foot-bridge, or they can cross on an endless rope.

An Austrian method is to take horses into the water with their head collars on and for the men to hold the head collars, keeping the horses' heads very close to the thwarts of the boat.

Swimming Horses with an Endless Rope.

A pair of holdfasts are driven in on each side of the river, as shown in Plate 118, and blocks to take a 2½ inch rope are lashed to them. The rope is made continuous by splicing the ends, and when working is kept moving by men pulling at A, A. The horses are tied on by their head ropes, with a running clove hitch. Plenty of men must be available on the

PLATE 118.

METHOD OF SWIMMING HORSES WITH AN ENDLESS ROPE.

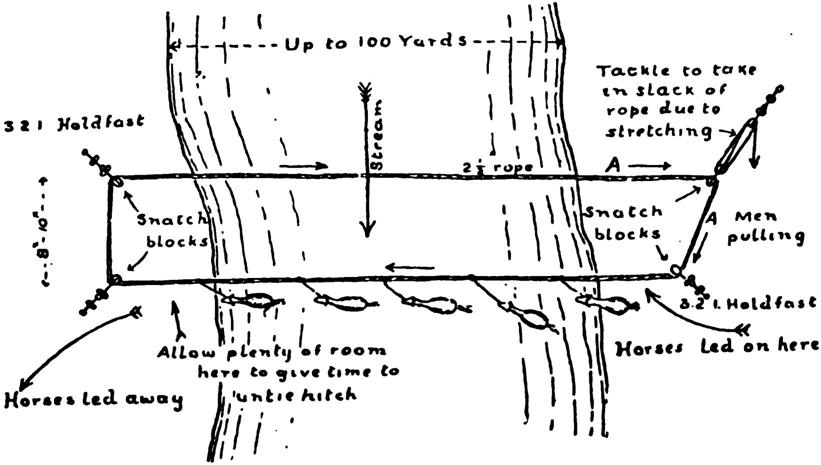
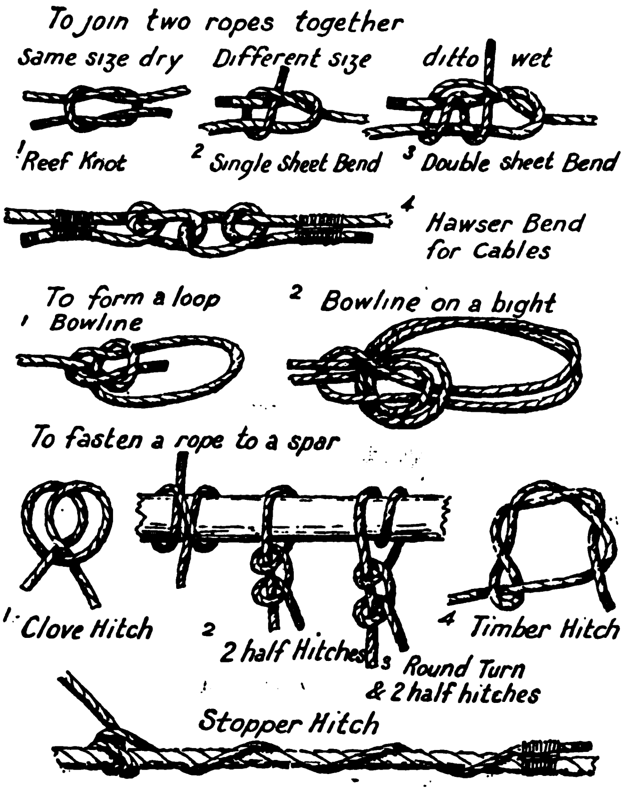

Up to 100 Yards
Tackle to take in slack of rope due to stretching
3 2 1 Holdfast
Stream
2½ rope
A
Snatch blocks
Snatch blocks
A Men pulling
8'-10'
3 2 1 Holdfast
Horses led on here
Allow plenty of room here to give time to untie hitch
Horses led away

PLATE 119.

KNOTS.


To join two ropes together
Same size dry
Different size
ditto wet
1 Reef Knot
2 Single Sheet Bend
3 Double sheet Bend
4 Hawser Bend for Cables
To form a loop
1 Bowline
2 Bowline on a bight
To fasten a rope to a spar
1 Clove Hitch
2 2 half Hitches
3 Round Turn & 2 half hitches
4 Timber Hitch
Stopper Hitch

landing side to untie the hitch and lead the horses away. A block and tackle is introduced at one holdfast, so that the slack of the rope can be taken in, as it stretches considerably. This method is suitable for a river up to 100 yards wide. The time taken to cross is about one regiment per hour.

The non-swimmers, taking all saddlery and kits, must make preparations for constructing rafts of barrels or timber, if boats are not available, so as to get the transport, ammunition, and saddlery across dry. If barrels, timber in quantity, etc., are not available, rafts can be improvised as described on pp. 798–800.

Infantry Fording a River.

If the ford is a deep one, infantry should choose a re-entering bend where the bank on the near side is higher than that on the far side, and where there is an easy exit. The ford should be lined down stream with horsemen. The men should turn slightly up stream, fix their eyes on the opposite bank, and cross in a succession of lines equal to the width of the ford, a sufficient interval being allowed between the lines to permit the free flow of the water.

PART XV.

FIRST AID.

General Usefulness of Knowledge of First Aid.

A knowledge of the subject of "First Aid to the Injured" is extremely useful, especially to the soldier, since a man who understands its principles may very frequently be the means of saving the life or limb of a comrade, to say nothing of his own. But First Aid should be regarded as only a temporary measure, and skilled medical assistance must always be obtained as quickly as possible.

We will now consider some of the cases in which First Aid can be of the greatest service.

WOUNDS.

General Treatment.

The first step in the treatment of a wound is to arrest hæmorrhage (bleeding); the second is to protect it from contamination.

Plate 120 has been prepared for the purpose of showing the position of the various arteries.

(1) To arrest Hæmorrhage.

(*a*) *Hæmorrhage from an Artery.*

If the bleeding should be severe, or arise from an artery, in which case the blood, besides being of a bright red colour, would spout from the wound in jets corresponding with the beats of the heart, *act without a moment's delay*, and treat as follows:—

Place a pad over the wound, pressing firmly on it with the fingers of one hand. Without relaxing this pressure, feel with the fingers of the other hand for the artery above the wound, viz., between it and the heart, and press firmly on that artery, if possible holding it against the bone of the limb.

The place where each artery should be compressed is shown by a blue spot in Plate 120. In the case of the brachial and subclavian arteries the exact spot is also shown in Plate 121, Figs. 1 and 2. If absolutely necessary, an improvised tourniquet, such as that shown in Plate 121, Fig. 3, may be applied, a pad being put over the artery, though pressure on the wound itself will temporarily arrest any bleeding. But great care must be taken with a tourniquet, since it is a dangerous implement in the hands of a comparatively unskilled man.

(b) *Hæmorrhage from a Vein.*

If, however, the hæmorrhage is from a vein, which can be ascertained by the colour of the blood, which will be of a very dark colour and will flow in a steady stream, the treatment should be as follows:—

Arrest the hæmorrhage by the application of a pad, such as a clean folded handkerchief or rag, further pressure being then firmly applied by means of a bandage, or another handkerchief wound round the limb above the pad. If the injury is on a limb, the limb should also be elevated. Care should be taken to remove any constriction, such as tight clothing, or a garter between the wound and the heart.

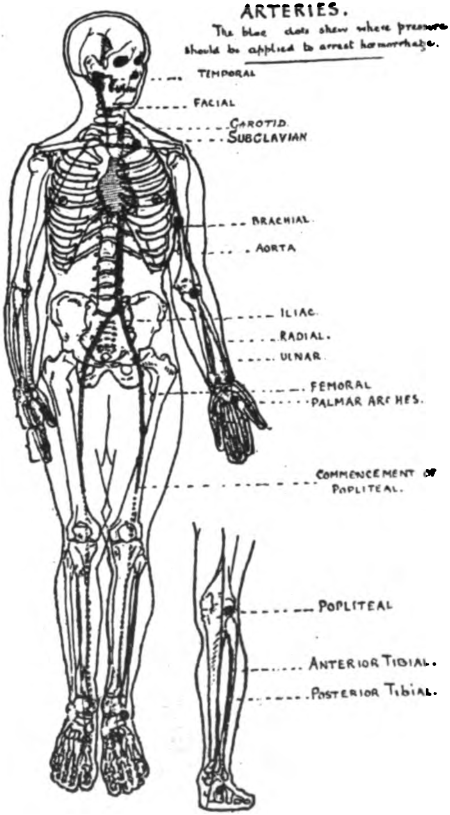
Keep the patient lying down, and do not let him move until the hæmorrhage ceases.

(2) Protecting the Wound from Contamination.

To protect a wound from contamination apply a covering usually called a "dressing," to the wound, thus excluding the numerous germs which are present in the air, clothing, etc.

For this purpose, if a regular bandage or field dressing is not

PLATE 120.



ARTERIES.

The blue dots shew where pressure should be applied to arrest hæmorrhage.

TEMPORAL
FACIAL
CAROTID
SUBCLAVIAN
BRACHIAL.
AORTA
ILIAC.
RADIAL.
ULNAR
FEMORAL
PALMAR ARCHES.
COMMENCEMENT OF POPLITEAL.
POPLITEAL
ANTERIOR TIBIAL.
POSTERIOR TIBIAL.

PLATE 121.

Places where certain arteries should be compressed

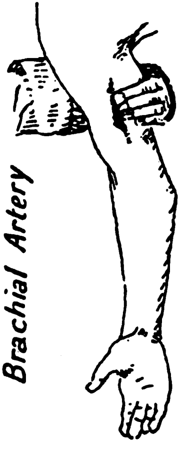


FIG. 1. Brachial Artery

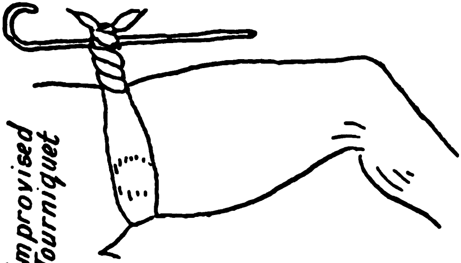


FIG. 3. Improvised Tourniquet

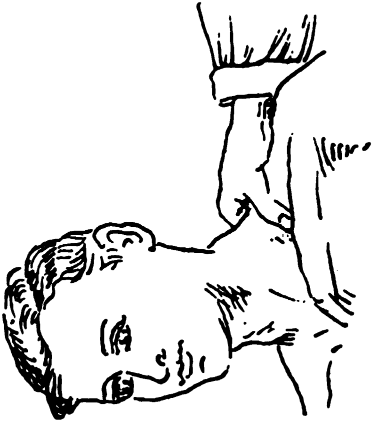


FIG. 2. Subclavian Artery

handy, a clean handkerchief folded into the form of a pad, and kept in position by means of another handkerchief will suffice. On active service the first field dressing, which is carried by every soldier, should, of course, be used.

Treatment for Abdominal and Chest Wounds.

In wounds of the abdomen or chest, apply the first field dressing, and move the patient as gently as possible, avoiding all shaking or jolting. In wounds of the abdomen give *nothing* by the mouth. If the legs and thighs are bent upwards towards the body, this will relax the walls of the abdomen and give the patient relief. In the case of severe wounds of the chest or penetrating wounds of the abdomen, erect a shelter over the patient, but do not attempt to move him.

Injuries to the Eye.

Foreign Bodies in the Eye.

If a foreign body is in the eye, the first step is to prevent the eye being rubbed.

Under Lower Eyelid.

If the foreign body is under the lower eyelid, moisten and twirl up the corner of a handkerchief, pull down the lower eyelid, and gently brush it off with the corner of the handkerchief.

Under Upper Eyelid.

If the foreign body is under the upper lid, take hold of the lid between the finger and thumb and pull it away from the eyeball; push the lower lid up beneath the upper, and then let go the upper lid. The hairs of the lower lid may by this means brush away the foreign body from the inside of the upper.

If this is unsuccessful, seat the patient in a good light; stand behind him so that his head rests against your chest. Gently press a wooden match or pencil on his eyelid half an inch above the border. Seize the border between your finger and thumb, and roll the lid inside out over the match.

If no match or suitable substitute is available, press with the thumb on the eyelid, and turn up the eyelid with the finger. Brush the foreign body gently off, and turn the lid back again.

If the irritation caused by a foreign body does not disappear immediately after it is removed, a cold compress applied to the eye will give relief.

Embedded in the Eye.

If a piece of steel, or other foreign body is embedded in the eye, do not attempt to remove it, but pulling down the lower lid, drop in a little olive oil or castor oil. Close the lid, and apply a soft pad and bandage. Obtain medical advice as soon as possible.

If a thorn, branch, or any other sharp substance has in any way damaged the eye, obtain medical advice at once, and in the meantime apply a soft pad and bandage.

If it is necessary to examine the eyeball for any injury, seat the patient in a good light: gently open the lids, and carefully notice if there is any cloudiness of the transparent membrane on the front of the eye, any unusual redness of the white of the eye, or any actual wound.

Burns of the Eye.

Burns may be caused by hot water, steam, molten metal, hot ashes or caustics.

Remove any foreign matter with a piece of linen or wool dipped in oil. Drop a little olive or castor oil into the eye. Close the eyelids and apply a cold compress and bandage.

Lime in the eye may cause severe burns. To treat this: remove without delay any particles of lime that are seen, and then let some cold water run gently well over the eye. Drop in some oil, and apply compress and bandage.

Vitriol if thrown into the eyes generally causes destruction of sight, but the best First Aid treatment is to bathe with water to which a little washing or baking soda (a teaspoonful to half a pint) has been added. Obtain medical advice as rapidly as possible.

Wounds of the Eyeball.

Wounds of the eyeball are attended by very grave dangers, and medical treatment should be obtained as soon as possible.

In the meantime, close the eyelids—apply a cold compress and a firm bandage.

Wounds of the Eyelids.

If the eyelid is cut or damaged, gently cleanse the wound with cold water; if there is much bleeding, apply pressure on the bleeding vessels until bleeding has stopped, or very much diminished. Bring the edges of the wound as perfectly together as is possible, apply a compress and bandage firmly, and obtain medical advice as soon as practicable, especially if the lid be cut through.

Eye Bandage.

An eye bandage is a narrow fold bandage, as shown in Plate 122, Fig. 1, the middle of which should be placed over the injured eye; one end is then passed under the ear of the same side, and the other end above the ear of the opposite side so that it clears the other eye. The ends are then tied behind the head.

If both eyes are injured, the bandage should be placed over both eyes and tied round the head.

DRESSINGS AND BANDAGES.

First Field Dressing.

The First Field Dressing consists of:—

An outer cover of sewn khaki cloth, containing two complete dressings.

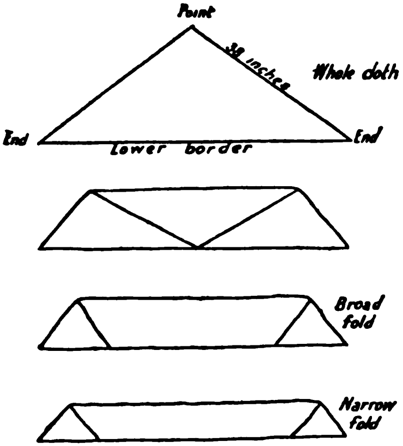
Each of these dressings consists of:—

(1) A cotton bandage, 2½ yards long by 2½ inches wide;
(2) A blue gauze pad, 4 inches by 3¼ inches, stitched to the bandage 18 inches from one end;
(3) One safety pin.

PLATE 122.

BANDAGES.

FIG. I. *Triangular Bandage*


Point
38 inches
Whole cloth
End
End
Lower border
Broad fold
Narrow fold

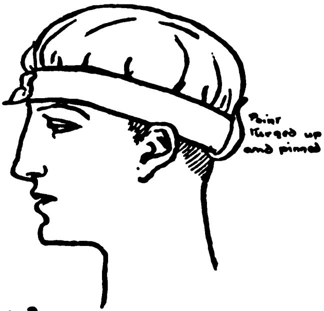

Point turned up and pinned

Fig 2.

Head bandage.

The bandage and pad are enclosed in a cemented waterproof cover having one of the corners turned back.

The pin is wrapped in waxed paper and attached outside the waterproof cover.

To open: Pull tapes of outer cover apart. Tear corner of inner cover in direction indicated by arrow.

To apply: Take the folded ends of the bandage in each hand, and, keeping the bandage taut, apply the gauze pad to the wound and fix the bandage.

One dressing to be used for each wound.

Be particularly careful not to handle either the gauze or the wound.

Triangular Bandage.

The triangular bandage is largely used on Field Service, and a knowledge of how to apply it is extremely useful. If a regular triangular bandage is not available, one can always be improvised by folding a large handkerchief or scarf diagonally.

The unfolded bandage, Plate 122, Fig. 1, is called a "whole cloth."

The following are the methods of folding this bandage, and applying it to various parts of the body:—

The broad and narrow folds may be applied in numerous simple ways for keeping dressings in position, or for fixing splints to an injured limb.

To make a "broad fold," as shown in Plate 122, Fig. 1, carry the point to the centre of the lower border, and then fold the bandage once again in the same direction.

To make a "narrow fold," as shown in Plate 122, Fig. 1, fold a "broad fold" over once again in the same direction.

Methods of applying Bandages.

1. *Application to Head.*

To apply the bandage to the head, place the centre of a whole cloth on the top of the head, with the point hanging down behind, and the lower border lying just above the eyebrows. Then pass the ends round the head, above the ears, crossing them over the point of the bandage, bring them forward round the head again, and knot over the centre of the forehead as shown in Plate 122, Fig. 2 (p. 813).

Carry up the point behind and pin it to the bandage at the back of the head.

2. *Greater Arm Sling.*

To apply the greater arm sling, take a whole cloth, place the point behind the elbow of the injured arm, throw one end over the shoulder on the sound side, carry it round the neck so as to lie over the opposite shoulder; allow the other end to fall down in front of the patient, bend the injured arm carefully and place it across the chest on the middle of the bandage, thumb pointing towards the chin; bring up the lower end in front of the forearm, and knot off to the end, which is lying over the shoulder on the injured side. Draw the point forward round the elbow and pin off, as shown in Plate 123, Fig. 1.

3. *For Broken Collar Bone.*

The bandage for a broken collar bone is tied in practically the same way as for a greater arm sling, except that the end on the injured side should be passed under the armpit and knotted off behind the neck, as in Plate 123, Fig. 2. By this means pressure on the injured collar bone is avoided.

4. *Lesser Arm Sling.*

To make a lesser arm sling, apply a broad fold as shown Plate 124, Fig. 1 (p. 817).

5. *Application to Shoulder.*

To apply a bandage to the shoulder, place the centre of a whole cloth on the top of the shoulder, point upwards, the lower border lying across the outside of the arm. Fold the lower border inwards, carry the ends round the arm, cross on

PLATE 123.

BANDAGES.

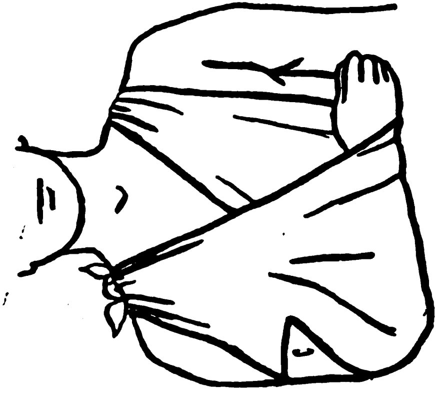


Fig 1. Greater arm sling

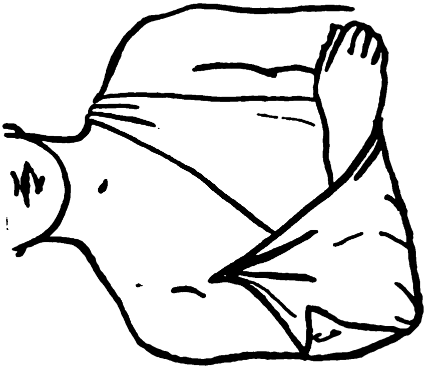


Fig 2. Sling for fractured collar bone.

PLATE 124.

BANDAGES

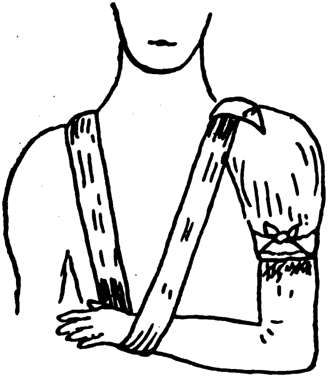


FIG. I. *Lesser arm sling and shoulder bandage*

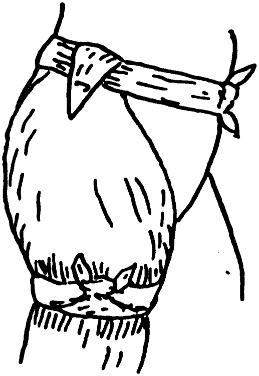


FIG. 2. *Application of triangular bandage to hip.*

the inside, bring them round the arm again, and knot on the outer side of arm. Then apply a lesser arm sling, bringing the point of the whole cloth, which has just been applied to the shoulder, under the lesser arm sling, fold it over, and pin as shown in Plate 124, Fig. 1.

6. *Application to Hip.*

To apply a bandage to the hip, tie a narrow fold round the waist, knotting it in front, and placing the centre of a whole cloth, point upwards, over the injured hip, fold the lower border inwards, pass the ends round the thigh, cross them on the inside, carry them round the thigh again and knot on the outer side. Then draw the point beneath the narrow fold, turn over, and pin as shown in Plate 124, Fig. 2.

7. *Application to Perineum.*

Injury to the perineum may be caused by falling astride any body sufficiently narrow to allow it to bruise the part, and in such cases serious consequences are apt to follow, such as bloody urine or complete stoppage. In such an injury, the patient must endeavour to refrain from passing urine until medical aid has arrived. To bandage the perineum tie the two ends of triangular bandage round the waist, and bring the point between the legs and tie to one of the ends at the back.

FRACTURES OR BROKEN BONES.

Signs.

A fracture can usually be detected by an obvious loss of power in the limb, and by pain and swelling.

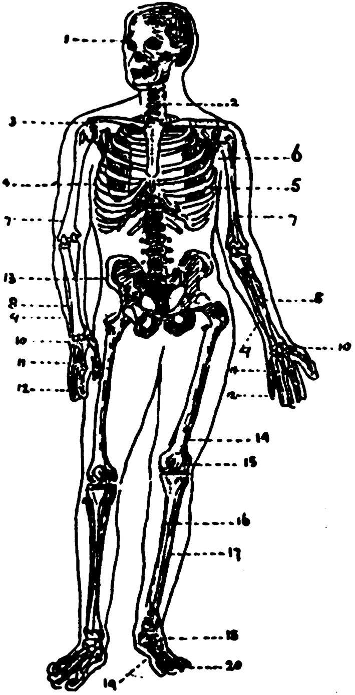
The bones, the fractures of which are subsequently referred to, are shown on Plate 125 (p. 819.)

General Treatment.

The first principle when treating a fracture is *not* to handle the limb unnecessarily with the idea of ascertaining the exact

PLATE 125.

SKELETON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1 Cranium, or skull.
2 Spine formed of vertebrae.
3 Clavicle, or collar-bone.
4 Ribs.
5 Sternum, or breast-bone.
6 Scapula, or shoulder-blade
7 Humerus
8 Radius
9 Ulna.
10 Carpus, or wrist bones
11 Metacarpal bones.
12 Phalanges, or fingers
13 Pelvis.
14 Femur, or thigh bone.
15 Patella or knee-cap
16 Tibia.
17 Fibula
18 Tarsus, or ankle bones.
19 Metatarsal bones.
20 Phalanges, or toes.

nature of the injury. If there is any doubt, assume that a fracture exists, and treat accordingly.

The second principle, is never to attempt to move the patient until the limb has been rendered immovable, thus preventing the possibility of the injury becoming worse, as, for instance, by the forcing of the broken ends of the bone through the skin.

Treatment of Particular Fractures.

The following are some of the commoner forms of fracture :—

(*a*) *Collar Bone.*

In addition to complaining of pain, the patient supports the elbow on the injured side with the opposite hand, and leans his head towards the injured side.

To treat a broken collar bone, place a pad, such as a couple of handkerchiefs, or a rolled up bunch of grass or fern, in the armpit, and apply a sling as shown in Plate 123, Fig. 2. Then tie a broad fold round the chest so as to keep the arm on the injured side fixed to the side.

(*b*) *Upper Arm.*

Apply some improvised splints, such as folded newspapers, brushwood, or straw bottle cases, round the arm, binding these firmly, but not tightly to the injured limb with a handkerchief, as shown in Plate 126, Fig. 2. They should not be bound directly over a wound. Then apply the greater arm sling as shown in Plate 123, Fig. 1, p. 816

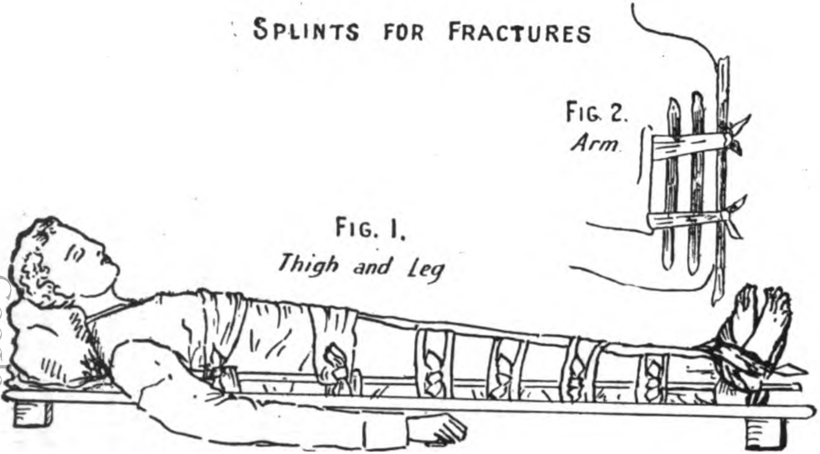
(*c*) *Forearm.*

Apply splints to the forearm in the manner already described, and then support the limb with a greater arm sling.

(*d*) *Leg and Thigh.*

Apply splints, and then bind the injured limb in three or four places to the sound leg. The sound leg will thus act as an additional splint, and become a support as shown in Plate

PLATE 126.



SPLINTS FOR FRACTURES

FIG. 1.
Thigh and Leg

FIG. 2.
Arm

126, Fig. 1. No bandage should be bound over the stomach, since it will tend to cause sickness.

(*e*) *Fractured Ribs.*

When the lung is not injured, apply two broad folded bandages firmly round the chest so that the centre of the second bandage comes immediately below the seat of fracture, and the bandages overlap each other.

If, however, the lung is injured, which may be suspected if the patient coughs or expectorates blood, a bandage round the body should not be applied.

DISLOCATIONS.

Signs.

The injured man complains of sickening pain and sits or lies with the limb in an unnatural position; the limb being fixed and altered in shape. Swelling and numbness will be felt down the limb and below the injury.

Treatment.

Do not attempt to replace the dislocated bone, but place the limb in the position most comfortable to the patient, and retain it in that position until medical aid arrives. In the case, however, of a dislocated finger or toe, the injured man or some other person may often easily pull it into position at once if medical aid cannot be readily obtained.

SPRAINS.

Cause.

The cause of a sprain is the overstretching of the ligaments of a joint or of the tendons in its neighbourhood.

Signs.

The usual signs of a sprain are:—

(1) Severe pain and swelling;
(2) Inability to use a joint.

Treatment.

To treat a sprain keep the injured part quiet. Put on cold compresses in the shape of wet cloths or handkerchiefs for as long as they relieve pain, but when they cease to give relief, apply hot fomentations.

Subsequently, rubbing and massage of the joint will often be of great use, but should never be undertaken except under medical advice.

RUPTURE.

The usual signs of rupture are a swelling or protrusion either in the groin or in its immediate neighbourhood, which generally appears suddenly after a wrench or strain.

Treatment.

The protrusion should, if possible, be replaced by laying the patient on his back, and placing a support beneath his buttocks so as to raise the pelvis. The thighs should then be slightly bent towards the abdomen. *Gentle* pressure will then sometimes effect a return of the protrusion to its natural position, but if this result is not at once attained, on no account persist in the attempt.

Medical aid should be obtained with the least possible delay, and if obtainable within a few hours it would be advisable to refrain from any attempt at reduction, unless the man who renders first aid is specially skilled in the matter.

INSENSIBILITY.

The following table shows the chief causes of insensibility and the usual signs and symptoms:—

Cause.	*Signs.*
(*a*) Shock from loss of blood, etc.	(1) If external bleeding, evidence shown by presence of blood. (2) If internal bleeding, blood may be coughed up if from the lungs, or vomited

(brownish in colour) if hæmorrhage is from the stomach.

Patient pale and collapsed, extremities cold and clammy, perspiration on forehead. Breathing short and rapid. Pulse very small and frequent. If semi-conscious will complain that he cannot see properly. Restless movement of hands, picking at things with his fingers.

(*b*) Fainting. Patient becomes pale, feeling of nausea, perspiration appears on the forehead, vision becomes dim, respiration somewhat hurried, and patient usually slowly sinks down on to the ground, where he lies motionless. Pupils are dilated. Pulse at first almost imperceptible, frequent and very small; and as patient recovers volume increases and colour returns. If fainting is caused by an external or internal hæmorrhage, convulsions may supervene.

(*c*) Epilepsy. Patient utters a cry and falls; he is at first rigid and blue, and after about half a minute there is general twitching of all limbs and muscles of the face. He may bite his tongue and throw his limbs about. Frothy saliva often streaked with blood appears round the mouth. The twitching ceases after about a minute and a half, and the patient lies in a condition of insensibility for some time.

(*d*) Apoplexy. Patient becomes more or less rapidly unconscious, breathing is laboured and noisy, and there is usually puffing out of the cheeks. The pupils are unequal; often the limbs on

	one side appear much more helpless than on the other. The patient cannot be roused.
(*e*) Sunstroke.	Vary in degree. (1) Simple exhaustion and prostration of muscular power usually occurs after exertion. The skin is cold, pale, and clammy. Pulse frequent and feeble. Death may take place from heart failure. (2) A condition of asphyxia may come on rapidly, and occurs especially after exposure to direct sun rays. The symptoms are unconsciousness, clammy skin, and feeble pulse. Death may take place from heart failure.
(*f*) Concussion.	Symptoms depend on severity of the injury. At first there is a collapsed condition, then a more or less complete loss of consciousness. Skin pale and extremities cold. Respiration is shallow. If he has fractured the base of his skull, there may be bleeding from the nose, mouth, and ears. After a varying time (up to several hours) patient becomes semi-conscious, moans, and frequently vomits. Pulse is fuller and skin is warm, and he passes into a drowsy condition from which he can be roused with difficulty. May be very irritable.
(*g*) Drunkenness.	Patient is more or less helpless. Face flushed or very pallid. Skin cold and clammy. If able to speak, he is incoherent. Strong smell of alcohol.
(*h*) Poison (opium).	Unconsciousness. Pupils very contracted. Breathing deep and slow, face at first flushed, later pale. At first may be aroused with difficulty. Smell of laudanum.

General Principles of Treatment.

The following are the general principles of treatment :—

Lay patient on his back ;
If there is a wound, arrest bleeding ;
Send for medical aid.

Undo any tight clothing round the neck or waist. Keep bystanders from crowding round the patient, and allow him to have plenty of fresh air.

If the patient's face is pale, keep his head low ; if his face is flushed, raise the head slightly on a folded coat or rug.

Do not give stimulants, because there may be a ruptured blood-vessel, and consequent hæmorrhage inside the skull as in apoplexy and some cases of concussion, in which case, if brandy is given, the heart is stimulated to beat more strongly, and consequently more blood is poured into the injured vessel.

In the case of epilepsy, keep the patient from injuring himself, by restraining his limbs, and place a gag, such as a piece of stick wrapped in a handkerchief, between the teeth in order to prevent him from biting his tongue.

In the case of sunstroke, carry the patient into the shade, douche the head and back of the neck with cold water. Do not give stimulants.

In the case of apoplexy or concussion, apply cold water to the head and hot water to the feet.

In the case of a drunken fit, lay the patient on his side, *not* on his back, slightly raise the head and remove any tight clothing. Induce vomiting by tickling the back of the throat with a feather.

Burns and Scalds.

Treatment.

In the case of burns and scalds, remove the clothing gently by cutting up the sleeves, etc., taking care not to *pull* any clothing off. Protect the burned part from the air by covering it with oil and flour or cotton wool. A burned person is very liable to suffer from shock ; accordingly, if his face is pale and cold, keep the head low and give him hot drinks, such as tea or cocoa.

If present when a person's clothing catches fire, lay him instantly flat on the floor, cover him with a rug, blanket, or woollen tablecloth and press out the flames.

Frost-bite.

Signs.

The affected portion—usually the nose, ears, fingers or toes—becomes blue and tingles, later on becoming white and numb.

Treatment.

Rub with cold water or snow. Do not let the patient go into a warm atmosphere or near a fire until the frost-bitten part has been thoroughly thawed.

Poisoning.

Signs.

The person suddenly becomes ill, having previously been apparently healthy. The symptoms usually come on immediately after some food or drink has been swallowed.

Treatment.

Send for medical aid at once. If the patient is conscious, always give him plenty of milk, and if you can obtain them, raw eggs. The reason for this is that the poison in the stomach may be enclosed in the clot formed by the milk, and the whole mass may then be got rid of by an emetic.

If the lips and mouth are *not* stained or burned—which would be evidence that a caustic poison had been swallowed—

give after the milk or eggs an emetic, such as a tablespoonful of salt or mustard in a tumbler of warm water, or, if these are not obtainable, induce vomiting by tickling the back of the throat with a feather. Then give more raw eggs, milk, and plenty of strong tea.

If the lips and mouth *are* burned, do not give an emetic or induce vomiting, because the injured and burned gullet might be ruptured by the exertion of vomiting, but give plenty of eggs, milk, or salad oil.

In all cases of poison, if the patient is restless and excitable endeavour to keep him quiet, but on no account let him go to sleep.

Electric Shock.

The sufferer is usually violently convulsed and unable to release himself from the source of danger. The obvious method of affording relief is to cut off the current by means of the "switch," which is always provided for the purpose; but unless this can be done *immediately*, other means of rescue must be resorted to. It should be remembered that it is dangerous to touch any part of the sufferer, even those parts covered with clothing, whilst he retains his hold on the wires.

The best method of rescue is for the rescuer to "insulate" himself, with substances which will not conduct electricity, from both the patient and the ground, so that he will be able to handle the patient and draw him away from the current.

The rescuer should stand on *dry* boards, glass, or rubber matting, or, if these are not quickly obtainable, *dry* clothes may be used; the hands should be protected by rubber gloves, *dry* mackintosh coat, rubber tobacco-pouches, or *dry* woollen or silk garments. If these precautions be adhered to, the sufferer may be safely withdrawn from his position of danger.

When rescued, place the patient in a recumbent position, loosen all tight clothing, and, if the breathing be weak, perform artificial respiration. Treat any burns as indicated in the preceding paragraph on pp. 826, 827.

PLATE 127.

FIG I.

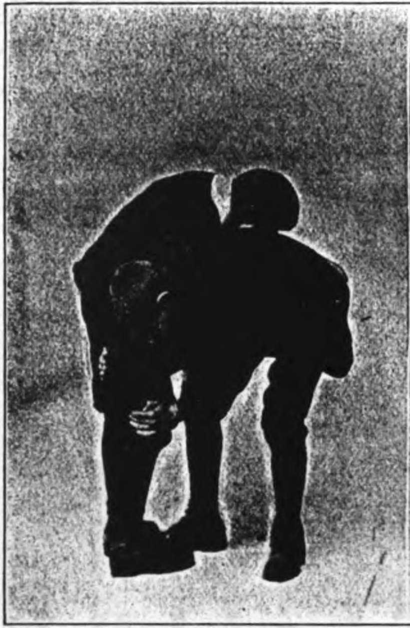


FIG. 2.

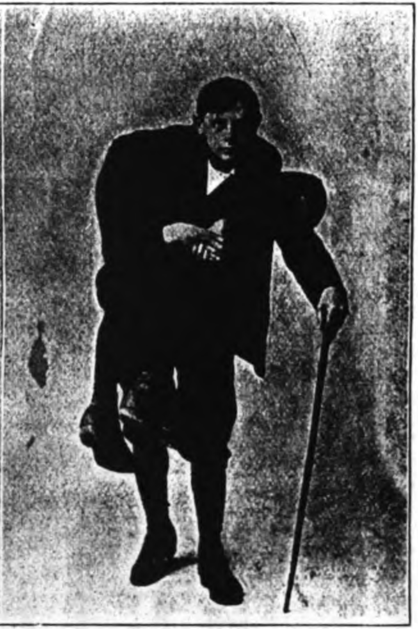


Photo by Martin. [*Lingfield*]

DROWNING.

General Principles of Treatment.

The general principles of treatment for drowning are as follows :—

Send immediately for :—

1. Medical aid ;
2. Blankets and dry clothing ;
3. Stimulants, brandy, hot water, etc.

Pending the arrival of these, do not let a moment pass without attempting to revive the patient. The steps which should be taken are :—

(1) Remove anything, such as weeds, mud, mucus or water, which may be blocking up the air passages and preventing the air from entering the lungs.

(2) Restore the respiration, *i.e.* induce the patient to draw air into his lungs.

(3) After this has been done increase the patient's chances of life by keeping him warm, and by promoting the heart's action.

The following is the method of carrying out these steps :—

(1) *Restore Respiration.*

Place the patient face downwards on the ground, the face turned to one side and the arms drawn forward.

Kneel astride (or on one side of) the patient's body facing his head.

Place your hands flat on the lower part of his back, thumbs close together, fingers spread over the lowest ribs.

Lean forward, keeping your arms straight, and press firmly downwards on the lower part of the back. Count "One, Two, Three," slowly while doing this.

Then swing backwards, releasing the pressure, but without lifting your hands from the patient's body. Count "One, Two," slowly.

Repeat this forward and backward movement about twelve to fifteen times per minute.

(2) *Restore the warmth of the Body and promote the Circulation.*

Apply hot flannels to the limbs, and promote circulation by friction.

When natural breathing has recommenced, lay the patient on his right side, rub the limbs and body towards the heart, wrap the patient in hot dry blankets, and remove him to shelter and then give him small quantities of warm brandy and water, beef-tea or coffee.

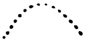
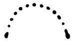
Snake-bite.

Signs.

The following are the usual signs of snake-bite :—

Faintness, difficulty of breathing ;

Two small punctured wounds are visible at the seat of injury.

A non-poisonous snake has two complete rows of teeth in each jaw, but a poisonous snake has only one row and two fangs. If a snake-bite looks like  it is non-poisonous. If it looks like  : it is poisonous. Very frequently, in the case of a bite by a poisonous snake, the two punctures from the poison fangs are the only marks to be seen.

Treatment.

Tie a handkerchief tightly around the limb above the bite *i.e.* between it and the heart.

Give the patient plenty of brandy or whatever other stimulant you can obtain. Cut the flesh round the bite freely, and squeeze as much blood as possible out of the wound.

If any permanganate of potash is obtainable, rub some crystals well into the wound. This treatment has recently been very well reported on, and in a country where snakes abound a small box of these crystals may be carried with advantage. If the patient should cease to breathe, induce respiration by artificial methods, as already described under the head of "Drowning."

Choking.

If the air passage is obstructed by a piece of meat or foreign body, suffocation may ensue. To prevent this, open the mouth, pass the forefinger right to the back of the throat and attempt to dislodge the obstructing body, or thump the back hard between the shoulders whilst the head is bent well forward and the mouth open.

Foreign Body in the Ear.

If an insect gets into the ear passage, fill the ear with olive oil, or, failing that, water, when the insect will float, and may be removed. Never syringe or probe the ear.

If a pea or other similar body gets into the ear, do not on any account attempt to get it out by probing with a sharp instrument. Seek medical assistance at once.

How to carry an Injured Man.

The following is the best way to carry an injured man:—

(*a*) When two persons are available to act as bearers:—

The bearers should kneel, one on each side of the injured man, each passing one arm beneath the patient's buttocks near the knees, and with the other arm grasping the shoulder or hip of the other bearer at the back of the patient. They then rise, lifting the patient between them.

(*b*) If only one bearer is available, and the injured man is quite helpless or unconscious, the best method is that known as the "fireman's lift," which is as follows:—

(1) Roll the unconscious man over on his face with his arms to his sides.

(2) Standing at his head, place your hands beneath his shoulders, and raise him to a kneeling position.

(3) Placing your hands beneath his armpits, stoop, place your head on his right side, bring his right arm round your neck, and pass your right hand between his legs and round his right thigh as shown in Plate 127, Fig. 1, p. 829. Bring his weight well on to your back, grasp his right wrist with your right hand, and rise to a standing position as shown in Plate 127, Fig. 2.

This method, which may sound complicated, is in reality extremely simple, and very easily learnt, and since it is by far the best method of carrying a helpless man in an emergency, every man should practise it.

'Tabloid' Products, etc., for Use in the Field.

The following 'Tabloid' and other Products, manufactured by *Messrs. Burroughs, Wellcome & Co.*, will be found of great use in the Field. They are made up in very small phials, which can be packed conveniently in a small leather wallet carried on a belt or strapped to the dees of a saddle:—

'Tabloid.' Quinine Bisulphate gr. 3 and gr. 5.	A general tonic, and a preventive of fever generally, especially malarial forms. Dose, one or more thrice daily.
'Tabloid.' Lead and Opium gr. 4.	An astringent, in diarrhœa and dysentery. Dose, one or two every three or four hours until symptoms cease.

'Tabloid.' Phenacetin Compound gr. 5.	Especially useful in neuralgia, headache, and to reduce high temperature. Dose, two every four hours.
'Tabloid.' Tannin gr. 2½.	To stop blood flow, as in nose bleeding or hæmorrhage from wounds, etc. It may be used dissolved in a small quantity of water, or finely powdered and applied to the wound on cotton-wool or lint.
Bismuth and Soda. gr. 5.	A stomach sedative and antacid especially in sensitive conditions of the stomach, such as indigestion. Dose, one or two every three hours.
Laxative Vegetable.	A general laxative. Dose, one or two at bedtime.
Potassium Chlorate gr. 5.	For a sore throat one should be dissolved slowly in the mouth, or to form a gargle, if warm water is available, 3 may be dissolved in half a tumbler of it.
Dover Powder gr. 5.	To induce gentle perspiration in cases of cold, or as a sedative. If used for sedative effect, dissolve in a little whisky or brandy and water.
'Soloid.' Hydrargyri perchoridi	Antiseptic.
Chlorodyne.	An astringent in diarrhœa or dysentery.
Hazeline Cream. (Trade Mark).	May be used generally for wounds and abraded conditions of the skin, sunburn, frost-bite, etc.

'Tabloid.' Potassium Permanganate, gr. 2.	Is useful in cases of snake-bite; a tabloid should be powdered and applied to the wound; 2 or 3 dissolved in a little water form an antiseptic wash.
Iron and Arsenic Compound.	An excellent iron tonic after an attack of fever. Dose, one or two three times daily, after food.
Dressings:—	'Tabloid's' pleated compressed bandages. 'Tabloid's' pleated cotton wool ,, ,, lint. ,, ,, double cyanide gauze.

Messrs. Burroughs, Wellcome & Co. manufacture suitable 'Tabloid' saddle or pocket medicine-cases, to contain the above preparations.

PART XVI.

MILITARY LAW.

AUTHOR'S NOTE.—*The following does not pretend to be anything but a brief summary of the principles and practice of Military Law, as regards some points which are most commonly arising.*

Persons Subject to Military Law.

Regular Forces.

Officers of the Regular Forces on the active list, including seconded and half-pay officers, warrant officers, N.C.O.'s, and soldiers.

Officers not on the active list are only subject if employed on military service under an Officer of the Regular Forces, or if, as reserve officers, they are called out for duty.

Army Reserve.

Soldiers when called out for (*a*) training, (*b*) in aid of the civil power, (*c*) on permanent service, or (*d*) employed in military service under an Officer of the Regular Forces.

Marines.

Officers and soldiers generally, when not subject to the Naval Discipline Act.

Yeomanry.

Officers (commissioned since August 16, 1901) and Permanent Staff always.

Officers (commissioned before August 16, 1901), N.C.O.'s, and men, when in training, serving with regulars, on actual military service and when serving in aid of the civil power.

Territorial Force.

Officers and Permanent Staff always, N.C.O.'s and soldiers when embodied, out for training, attached to Regulars, or called out for actual military service.

Special Reserve.

When embodied, out for training, or attached to Regulars.

Indian and Colonial Forces.

Indian and Colonial troops raised at the Imperial expense or under Imperial control, when serving under an Officer of the Regular Forces. Officers serving in the United Kingdom are under military law.

Troops locally raised and maintained in India or a Colony, only when serving with Imperial forces. Colonial legislatures can make their own provisions as to discipline within the colony.

Civilians.

All persons attached to a force on active service either in an official capacity or as holding a pass; or employed by the troops or a camp follower. It depends upon the nature of the pass given, whether the holder is treated as an officer or as a N.C.O. or man. Except such civilians no British subject in the United Kingdom can be placed under military law.

Procedure when an Offence has been Committed.

Arrest.

If possible, investigation should precede arrest.

Arrest is of two kinds—Open and Close. A soldier in open arrest will attend parades, but will not be detailed for any duties, other than those necessary to relieve him of any office, etc., which he holds. He will not bear arms except in an emergency or on line of march, or, in a detention barracks, for instruction, exercise or practice, nor will he appear at mess or at public places of amusement. A soldier in close arrest is in actual custody.

Officers are placed under "arrest," N.C.O.'s usually are. N.C.O.'s may be, and men are, placed in "confinement."

(a) *Arrest of an Officer.*

When an officer commits a military offence he may be placed under close or open arrest, according as the circumstances demand. If need be, he may be placed under charge of a guard, piquet, or sentry, or when on actual service, under the control of the provost-marshal.

The fact of the arrest should be reported at once to the G.O.C., under whose command the officer is serving.

An officer when released has no right to persist in considering himself under arrest. If he thinks himself aggrieved, he may proceed by complaint to the Army Council. This complaint is usually forwarded through the officer's commanding officer.

(b) *Arrest of a Warrant Officer or N.C.O.*

The rules which govern the close and open arrest of officers apply also to warrant officers and non-commissioned officers. In case of doubt as to the commission of the offence, the arrest may be delayed without prejudice to any subsequent proceedings; and if the offence is not serious it may be disposed of without previous arrest.

(b) *Arrest of a Private.*

A private soldier may be placed under open or close arrest.

An officer or N.C.O. ordering the arrest of a private should, as a rule, send for a file of the guard, and be careful not to go near the offender in case the man while being placed under arrest should be tempted to strike him, and so aggravate the offence.

The commander of the guard, or on active service the provost-marshal, is bound to receive the man placed under arrest.

The officer or N.C.O. placing the man under arrest should within 24 hours hand to the commander of the guard, or on active service the provost-marshal, an account called the "Charge" or "Charge Report," giving the name of the prisoner (if known), the offences with which he is charged, and the names of any witnesses. It should be signed by the officer or N.C.O. charging the prisoner.

If no " charge " is delivered within 24 hours the commander of the guard or provost-marshal, as the case may be, should report the fact of this omission to the officer to whom the Guard Report is rendered. If within 48 hours no account is delivered, the commander of the guard or provost-marshal may release the prisoner.

Investigation by Squadron or Company Officer.

Every charge against a N.C.O. or soldier must, in the first instance, be investigated by his company, etc., commander in the presence of the soldier in arrest. The investigation is to be held at such an hour as will allow of a soldier reserved for disposal by the C.O. being ready to go before him at the appointed time. Cases against soldiers under arrest should be disposed of every day (Sundays, Good Friday, and Christmas Day excepted). Where the accused is a private, the company, etc., commander, if he decides that the case is a minor offence, or a case of drunkenness, or absence without leave, which he has power to deal with under paras. 484 and 501 K.R., will either dispose of the case himself or leave it to his C.O. to deal with.

The case of a N.C.O. must always be left to be dealt with by the C.O., except that the company, etc., commander has power to admonish, but not reprimand, a N.C.O. not above the rank of corporal.

Every officer who does not summarily dispose of a charge which he investigates must carefully avoid any expression of opinion as to the guilt or innocence of the person charged.

Limits of a Company or Squadron Officer's Powers of Punishment.

A squadron or company officer may for any of the offences which can be summarily dealt with by the C.O. as set out on pp. 841-842 award the following punishments without referring to any superior authority:—

(1) Admonish (but not reprimand) a N.C.O. not above the rank of corporal.,

(2) Award to private soldiers, confinement to barracks, not exceeding 7 days. The C.O. can limit the powers of an officer of less than 3 years' service to award C.B. to 3 days (and usually does so).

(3) Extra guards and piquets.

(4) Regulated fines for drunkenness.

Offences which may be dealt with summarily.

The following offences mentioned in the Army Act can be summarily punished by a C.O. or be tried by R.C.M. convened by him, without reference to superior authority. (He may, however, apply to superior authority to have the offender tried by District or General Court Martial, or when on active service by a Field General C.M.).

Section 6.* For going in search of plunder:
For leaving his guard, piquet, or post without orders;
For striking a sentinel;
For impeding the provost-marshal or person acting as such;
For committing any offence against the property or person of any resident in the country in which he is serving;
For intentionally or negligently giving a false alarm;
For treacherously or negligently making known the countersign;
For irregularly appropriating for his own detachment any provisions proceeding to other forces;
For misbehaving as a sentry.

Section 8 (2).* For using threatening or insubordinate language to a superior officer (but not other offences mentioned in the section).

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* When on active service, the offences mentioned in these sections (6, 8, and 9) *must* be tried by Court Martial.

Section 9 (2).* For disobeying any lawful command of a superior officer.

Section 10 (2), (3), (4). For resistance to lawful custody or breaking out of barracks.

Section 11. For neglect to obey standing orders.

Section 14. For assisting or conniving at desertion.

Section 15. For absenting himself without leave, or being found out of bounds.

Section 18 (1), (3). For malingering or producing disease; or any misconduct whereby he produces or aggravates disease or misconduct in hospital.

Section 19. For drunkenness.

A private soldier is not to be tried by court-martial for an act of simple drunkenness, unless the offence was committed on active service or on duty or after being warned for duty or it renders him unfit for duty or unless there are four previous instances within the preceding twelve months against the accused, or unless he elects to be so tried instead of being dealt with by the Commanding Officer (see Army Act, s. 46 (3)).

Section 20 of Army Act. For permitting escape of person in custody (except when the act is wilful);

,, 21 ,, For irregularly arresting or detaining a person;

,, 22 ,, For escaping or attempting to escape from lawful custody;

,, 24 ,, For losing by neglect or making away with equipment, etc.; wilfully injuring the property of an officer or comrade or regimental or public property;

,, 27 (4) ,, For making false statements in order to prolong furlough;

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* When on active service, the offences mentioned in these sections (6, 8, and 9) *must* be tried by Court Martial.

Section 33 of Army Act.	For making false answers or declarations on attestation (except in the case of enlisting from the Army Reserve) ;
,, 34 ,,	For infringing generally enlistment regulations.
,, 40 ,,	For being guilty of conduct prejudicial to good order and military discipline.

In cases of all other offences the C.O. has no power to deal with an offender, but he should not send a case before court-martial when it appears doubtful whether the evidence will lead to a conviction, unless it is important that the guilt or innocence of the accused should be definitely decided. First and less serious offences under the above sections, as well as minor neglects and omissions, should, as a rule, be dealt with summarily.

Limits of a C.O.'s Powers of Punishment.

1. *Summary Punishments.*

On a private soldier, subject in all cases to the soldier's right to elect, previous to the award, to be tried by D.C.M.

(*a*) Detention up to 28 days for absence without leave exceeding 7 days, but the number of days' detention if over 7 must not exceed the number of days' absence.

(*b*) Detention up to 28 days (detention exceeding 7 days, *i.e.* 168 hours, except in cases of absence without leave, cannot be awarded by a C.O. under the rank of a field officer). A minor punishment must not be added if detention exceeds 7 days, but an additional punishment affecting pay, such as a fine or stoppage, can be awarded.

(*c*) Fines for drunkenness. The following scale of fines for drunkenness is compulsory, and must be awarded :—

(1) For the first instance in a soldier's career, nil.

(2) For the second offence, 2*s.* 6*d*.

(3) For the third and every subsequent offence, 5*s.*; but if the third or subsequent offence occurs within 6 months of the preceding offence, 7*s.* 6d., and if within 3 months, 10*s.*

(*d*) Stoppage of pay can be awarded to make good expenses caused by a soldier or any loss or damage. No greater amount must be stopped from a soldier's pay than is sufficient to cover the loss or damage, and after paying messing and washing the soldier must be left 1*d.* a day.

A N.C.O. can only be

1. Admonished;
2. Reprimanded;
3. Severely reprimanded;
4. Deprived of acting or lance rank;
5. Deprived of any position in the nature of an appointment.

Warrant officers cannot be punished by a C.O. or tried by a R.C.M. (Army Act, s. 46 (8)).

2. *Minor Punishments.*

A private soldier may be punished by

(*a*) Confinement to barracks up to 14 days;
(*b*) Extra guards and piquets;
(*c*) Admonition, but *not* by reprimand.

3. *Field Punishments.*

The same punishments may be awarded as given above under the head of "Summary Punishments."

On active service a private soldier may be awarded field punishment up to 28 days, and may, in addition, be ordered to forfeit all ordinary pay up to 28 days.

Forfeiture of Pay.

A soldier forfeits his pay under the Pay Warrant (*vide* K.R. par. 495) for every day he is absent without leave. The C.O. must inform the soldier of the amount of forfeiture of pay which he has incurred, subject to the soldier's right to be tried by D.C.M. before the case is disposed of. The C.O. cannot himself award forfeiture of pay as a punishment.

Forfeiture of Good Conduct Badges.

A soldier forfeits one good conduct badge automatically every time his name appears in the Regimental Conduct Sheet. Except as above, a badge cannot be taken away by the C.O.

Application for Court Martial.

Where a C.O. remands the accused person for trial by court-martial he must immediately take steps to assemble a R.C.M. or to apply to a superior officer for a D.C.M. or G.C.M. Unless for some special reason this must be done within 36 hours.

An application for a D.C.M. or G.C.M. must be accompanied by the charge sheet (in duplicate), the summary of evidence, the regimental and (troop, squadron, or company) conduct sheets of the accused, the list of witnesses for the prosecution and defence (with their stations), a statement as to the character and particulars of service of the accused, and by whom to be proved, and a medical certificate as to the ability of the accused to undergo punishment.

The charge sheet should be signed by the officer in actual command of the unit to which the accused belongs.

In his letter of application the C.O. must state his reasons for desiring the particular description of Court for which he applies.

If the accused has elected to be tried by D.C.M. instead of submitting to a summary award it should be so stated in the form of application (Army Form B. 116).

The name of the officer who investigated the charge should be stated in the application.

Courts Martial.

Different kinds of Courts Martial.

The various kinds of Courts Martial are :—

(*a*) General ;
(*b*) District ;
(*c*) Regimental ;
(*d*) Field General.

Convening of General, District, and Regimental Courts Martial.

Before the assembly of a R.C.M. an interval of not less than 18 hours must be allowed to elapse after the accused has been informed that he is to be tried, unless the exigencies of the service render it impossible to do this. Subject to this rule a R.C.M. should be convened as soon as practicable.

In the case of a D.C.M. this interval should be not less than 24 hours.

The officer before convening a court-martial should first satisfy himself that the charges to be tried are for offences within the Army Act, and that the evidence justifies a trial on these charges.

The convening officer appoints or details the members and President of the Court, but cannot himself sit in either capacity.

The convening officer shall take proper steps to procure the attendance of the witnesses, and shall send to the officer appointed President the original charge sheet on which the accused is to be tried and the summary of evidence.

Composition of General, District, and Regimental Courts Martial.

	G.C.M.	D.C.M.	R.C.M.
Numbers of Members in United Kingdom, India, Malta, and Gibraltar	9	3	3
Number of members elsewhere .	5	3	3
Minimum length of member's service in years	3	2	1

Qualifications of Members of General, District, and Regimental Courts Martial.

The President for G.C.M. should be a General or Colonel, and no officer under the rank of Captain.

The President for D.C.M. should be a field officer, although a captain or subaltern can act in cases of great emergency.

The President for R.C.M. should not, if possible, be under rank of captain.

On a G.C.M. *not less than* 5 of the members must be of rank not below that of captain, *e.g.* where the G.C.M. consists of 9 members, 4 of these may be subalterns, unless the court is for the trial of a field officer, in which case no one below the rank of captain is eligible.

A member is not eligible to sit on any C.M. unless he is a commissioned officer of sufficient rank and service as mentioned above, and is subject to military law. An officer should, if possible, have attended as a supernumerary on several previous occasions.

Field General Court Martial.

A Field General C.M. deals with all offences committed on active service.

Convening of Court.

A Field General Court Martial may be convened by—

(1) An officer in command of a detachment beyond the seas when not on active service, for charges against persons under his command in respect of offences against the property or persons of the inhabitants of the country.

(2) By the C.O. or officer in immediate command of a body of troops on active service for the trial of offences committed by persons subject to military law.

Composition of Court.

The court must consist of not less than 3 officers, if possible; but if 3 officers are not available, 2 may be appointed. The convening officer may appoint himself President, if no other officers are available, but the President should always, if practicable, be a field officer, and the members should have not less than 1 year's service. If they are available, officers with not less than 3 years' service should be appointed.

Summary of Procedure at all Courts Martial.

On the court assembling—

1. The order convening the court should be read, also names, rank, and corps of officers serving on the court, and the members of the court must satisfy themselves that the court is properly constituted.
2. Members of the court must satisfy themselves that the accused is amenable to military law, and that the charge is one which they are empowered to try.
3. The prosecutor then takes his place, and the accused is brought before the court.

   The accused can object to any members of the court, but not to the prosecutor, or to the Judge Advocate, if present. His objection must be to individual members, and he must state and prove his reasons (*e.g.* bias or opinion already formed). If his objection is sustained, the officer objected to must be replaced by a waiting officer; if one is not present, the court must adjourn.
4. The court being properly constituted, the oath should be administered to each member of the court.

The following persons, if present, are also sworn:—

The Judge Advocate, officers attending for instruction, shorthand writers, and interpreters.

Any person objecting to be sworn makes a solemn declaration.

5. After the members of the court and other persons are sworn, the charges upon which the accused is arraigned must be read to him, and he will be required to plead separately to each charge.

   Before pleading to a charge the accused may offer a special plea, *e.g.* to the general jurisdiction of the court, viz. that the court is not properly constituted; that he is not subject to military law, etc. Again, he may object that the charge is one which cannot be made under the Army Act or the Rules of Procedure. He may also plead that he has previously been acquitted or convicted of the charge by a competent court, or that he has been pardoned, or that it has been barred by lapse of time. If the plea is allowed, the court must report to the convening officer and adjourn; if not allowed, the trial is proceeded with, and—

6. The accused must make the general plea of "Guilty" or "Not Guilty" to each charge. If he refuses to plead, or does so unintelligibly, a plea of "Not Guilty" is recorded on each charge. At the time of the general plea, the accused may offer a plea in bar of trial, *i.e.* that he has been previously acquitted or convicted on the same charge, or has been pardoned for it, or that, by lapse of time, he cannot be convicted of it.

7. After a plea of "Guilty" the court shall receive any statement which the accused desires to make, shall read summary of evidence, if any, and annex it to the proceedings.

   The accused may make a statement in mitigation of punishment, and may call witnesses as to character. The accused may at any time withdraw his plea of "Guilty" and plead "Not Guilty," or *vice versa*.

8. After the plea of "Not Guilty"—
   (*a*) the prosecutor, if he wishes, may make an opening address;
   (*b*) the evidence for the prosecution shall then be taken.

If it is necessary for the prosecutor to give evidence, he should do so after the delivery of his address. He must be sworn, and may be cross-examined by the accused.

9. At the close of the evidence for the prosecution, the accused shall be told by the court that he may give evidence as a witness, subject to his liability to cross-examination. He should then be asked if he wishes to give evidence himself or to call other witnesses.

10. If the accused does not give evidence, or immediately after his evidence, if he is the only witness for the defence, the prosecutor may address the court a second time. The accused will then be asked if he has anything to say in his defence. He may address the court in defence, and produce witnesses as to character. In reply to witnesses to character, the prosecutor may produce proof of former convictions and entries in the conduct book.

11. If the accused calls witnesses other than himself, he addresses the court immediately after their evidence, and the prosecutor may then address the court in reply.

12. The Judge Advocate, if any, will, unless he and the court think a summing-up unnecessary, sum up in open court the whole case as presented to the court.

13. The court will then deliberate on their finding in closed court, the opinion of each member being taken separately on each charge. The finding of the court will be either "Guilty" or "Not Guilty," or "Not Guilty and honourably acquit him of the same."

14. If the finding is "Guilty," the court in determining the sentence may take evidence of record, character, age, service, recognised acts of gallantry or

SCALE OF PUNISHMENTS.

Section of Army Act.	Punishment.	Court by which this can be awarded.
	OFFICERS.	
	Death.	General Court Martial.
	Penal servitude, not less than 3 years.	
	Imprisonment, with or without H.L. for 2 years.	
44	Cashiering.	
	Dismissal from H.M.'s service.	
	Forfeiture of rank, *i.e.* post-dating his commission but not reduction to a lower rank.	
	Reprimand or severe reprimand.	
137	Stoppage to make good any loss; forfeiture of pay for absence without leave.	
	SOLDIERS.	
48	Death.	G.C.M.
	Penal Servitude, not less than 3 years.	
44	Imprisonment, with or without H.L. not exceeding 2 years.	D.C.M.
	Detention for 2 years.	
	Discharge with ignominy.	
	Forfeitures, *i.e.* of sums towards pension, or of any military decoration or reward.	
47	Detention for 42 days.	R.C.M. (but as a rule a N.C.O. above the rank of corporal should not be tried by R.C.M., K.R. par. 458).
	Forfeiture of seniority or reduction of N.C.O. to lower grade or ranks.	
	Fines, for drunkenness only.	
	Stoppages to make good any damage or loss.	
	Dismissal of a territorial.	

distinguished conduct of accused, length of time he has been in arrest, etc.

If the finding is "Not Guilty," the President will date and sign the proceedings, the findings will be announced in open court, and the accused will be released.

The proceedings will be duly authenticated and transmitted for confirmation.

Confirmation of Proceedings.

The finding and sentence of a R.C.M. are to be confirmed by the convening officer.

The finding and sentence of a D.C.M. are to be confirmed by an officer authorised to convene a G.C.M., or deriving authority from an officer so authorised.

The finding and sentence of a G.C.M. are to be confirmed by His Majesty, or by an officer deriving authority to confirm from His Majesty, *i.e.* if held in the U.K. by the Judge Advocate-General in London; if held elsewhere, by the general or other officer having power to confirm.

The original proceedings, and not a copy, must be dated and signed by the President immediately after the finding, and sent at once to the confirming officer.

An acquittal is final and needs no confirmation.

PUNISHMENTS WHICH MAY BE AWARDED BY A FIELD GENERAL COURT MARTIAL.

The court, if consisting of 3 members, may award any sentence which a G.C.M. can award; but if the court pass sentence of death, the whole court must concur.

If the court consists of 2 members only, it can award any sentence authorised for the offence, not exceeding field punishment or 2 years' imprisonment.

Summary of Rules of Evidence.

The Rules of Evidence to be followed by courts-martial are those adopted in the courts of ordinary criminal jurisdiction in England.

There are some facts of which the courts take judicial notice, *i.e.* which need not be proved.

viz.: Law and Practice of the Courts;
Public Acts and matters connected with the government of the country;
Matters of common and certain knowledge, viz. the course of the seasons, the relative rank of officers, etc.

Some facts known as Presumptions, are inferred, without evidence, from some other facts already proved or assumed to exist.

Presumptions are of three kinds:—

1. Presumptions of fact; *e.g.* proof of recent possession by prisoner of stolen goods raises a presumption against him of having stolen or received them knowing them to be stolen.
2. Rebuttable presumptions of law, *e.g.* the presumption that a man is innocent until proved guilty, or that an infant between 7 and 14 is incapable of criminal intent, or that a person holding and acting in public office has been duly appointed thereto, etc.
3. Conclusive presumption of law, *e.g.* that an infant under the age of 7 cannot be guilty of a felony.

By which side proof must be given:—

General Rule—He who alleges a fact must prove it, whether the fact be couched in negative or affirmative terms.

Some exceptions to rule:—

(*a*) In acts which are by Statute made criminal if done "without lawful excuse," viz. being found by night in possession of house-breaking implements, the burden of proving lawful excuse is on the party charged.

(*b*) In acts which are by Statute declared criminal if done " with intent to defraud, deceive, injure, etc.," *e.g.* forgery, proof of absence of fraudulent intent is on the person charged, after proof of a forgery to which he was a party has been given.

Two great principles of evidence :—

1. A party may prove all facts that are relevant to the issue and no others.
2. A fact must be proved by means of the best evidence which the nature of the case will admit.

Relevancy.—Certain facts are not relevant, viz. (as a rule) a person's conduct on other occasions than that in question and his character.

Exceptions to Rule.—Where guilty knowledge or intention is an essential part of a crime, and the physical acts have been proved, the guilty knowledge or intention may be proved by evidence of former conduct, *i.e.* of similar acts done on former or subsequent occasions to the occasion in question, *e.g.* obtaining property by false pretence, evidence of obtaining by the accused under similar circumstances before or after the particular occasion, may be given, so also in regard to uttering of forged documents, etc.

N.B.—A prisoner is always at liberty to call evidence to show that he has a general good character amongst his friends and acquaintances as raising an improbability of his being guilty of the offence alleged, and on an indictment for rape, or indecent assault, the prisoner may produce evidence of the bad character of the prosecutrix in respect of chastity and morality, with himself or generally.

Best Evidence Rule.—The evidence produced must be the best obtainable under the circumstances, viz. :—

(*a*) The verbally given contents of a document can never be received if the document itself is available.

(*b*) Subject to certain exceptions, a copy of a document is not admissible when the original copy can be produced.

Exceptions : Secondary evidence is allowed of public documents, documents in possession of another party, which, after reasonable notice, have not been produced, documents in possession of a stranger who is not bound to produce them, entries in bankers' books, etc.

Evidence of two kinds :—

1. Direct evidence, *i.e.* that of a person who saw or otherwise observed with his senses the fact in question.
2. Indirect or circumstantial evidence, *i.e.* evidence of facts from which the fact in question may be inferred.

Principal rules in the giving of evidence :—

(*a*) The witness must be competent.

Two kinds of incompetence :

1. Mental incapacity ;
2. Interest, viz. a person charged jointly with another is a competent witness only for the defence and not for the prosecution, unless such person intended to be called by the prosecution has already pleaded guilty to the charge. Husband and wife cannot give evidence against one another unless specially allowed by statute, *e.g.* for assault by one on the other.

(*b*) The evidence must be on oath or affirmation.

(*c*) The witness may not repeat to the court his own previous narratives or statements concerning the relevant facts made to other persons out of court.

Exceptions to this rule, viz. :—

In cases of violence, the injured person may always prove the bare fact that he made a complaint; and in cases of several offences against women, the injured woman may prove the terms of the complaint, if made as soon as possible after the injury, *e.g.* in cases of rape, indecent assault and kindred offences. The terms of the complaint are admissible as tending to show consistency of conduct on part of prosecutrix.

(*d*) Hearsay is no evidence. What some one else told the witness is not evidence. He must say what he himself knows.

Exceptions to this rule :—

(1) Dying declarations in charges of murder or manslaughter, viz., the statements of a murdered man as to how he came by his death. To make these admissible, the declarant must have been in sound health and in "settled hopeless expectation of impending death." Statements by a person descriptive of his symptoms made to, *e.g.* medical attendant are admissible, but not statements giving the causes for such symptoms;

(2) Statements made by a deceased person against his pecuniary or proprietary interest;

(3) Statements made by a deceased person in the strict course of his duty.

(*e*) A confession, as a general rule, is not admissible as evidence against any person except the person making it.

It must be proved that the confession was free and voluntary.

In the case of a confession before any person in authority, such as a magistrate, police constable, or the accused's master, it must be proved that the confession was not made by reason of any promise or inducement of an advantage in relation to the offence or the proceedings upon it, or of any threat.

If a confession is given in evidence, the whole of it must be given and not merely the part disadvantageous to the accused.

Billeting.

Orders for the movement of troops in the United Kingdom are conveyed by means of documents called "Routes." On the production of a route, the police officer in charge of any place shall billet on victualling places the troops mentioned on the route. The keeper of each victualling house has to provide the food and accommodation authorised and is paid the prices sanctioned by Parliament. When the territorial force is embodied, regulars and territorials in case of emergency may be billeted in public buildings, warehouses, barns, etc.—Army (Annual) Act, 1909.

Impressment of Carriage.

Under an ordinary "route" the civil authorities may be called on to provide the transport necessary to move baggage. Under a "requisition of emergency," transport, horses, motor cars, and locomotives used for haulage only, and also barges, etc., for inland navigation, can be demanded for the conveyance of persons as well as baggage.

When the Army Reserve or Territorial Force are called out on permanent service, carriages, animals, and vessels can be purchased as well as hired on behalf of the Crown, and, if refused, can be forcibly taken possession of.

Conveyance of Troops by Rail or Tramway.

When an order in council has been issued stating that an emergency has arisen in which it is expedient that the Government shall have control of the railways and tramways, the Secretary of State can empower any person to take possession of a railway or tramway, and make use of it as directed. When an order for the embodiment of the Special Reserve is in force, the Secretary of State can claim precedence for military traffic over all railways and tramways.

APPENDIX I.

SIGNALLING.

MORSE CODE.

The Morse Alphabet is set out on Plate 128, p. 862.

Two elements are used, the "dot" (short) and "dash" (long), one dash being equal to three dots. The letters A, B, M, S, P, V, T will be called ack, beer, emma, esses, pip, vic, and toc respectively, to phonetically distinguish them from similarly sounding letters. The easiest method of learning the alphabet is by means of the "dummy key," a simple and inexpensive little instrument consisting of a small Morse key, as used for telegraphy, mounted on a wooden base. When sending, the knob should be held with the thumb and first two fingers, the key being depressed to the full extent for dots as well as dashes. The simpler letters should be learnt first, with their opposites and the remainder of the alphabet built upon them. In the navy the method of instruction is by means of sentences, the initial letters of each word consisting of opposite letters, as:—

· —	Authorities.	— ·	Never.
— · ·	Deny.	· · —	Uniformity.
— · · ·	Brings.	· · · —	Victory.

Sending Message on Morse.

To attract an unknown station send succession of dots until answered with "general answer" (T). All groups and words are answered with (T), except prefix and code time, both of which are repeated as an additional check. Before sending figures, send FI "figures intended," and at conclusion FF "figures finished." All figures are checked back by reader by means of following check letters, A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7, H for 8, I for 9 K for 0. Send cipher sign (CC) before and after all groups of cipher or important words. All groups or words sent in cipher are repeated by reader. When ready to commence send KQ, "are you ready." If ready, answer is G "go on," if not ready, MQ "wait." To separate text of messages from addresses send break signal - . . . -, before and after. To erase word sent incorrectly send succession of dots until reader answers with same signal. At end of message send VE, "end of message," if correct, RD, "message correct," is sent. To obtain corrections or supply omissions, send WA "word after" or WB "word before," giving next word to doubtful one. To send stop signal (*a*) with flag. Wave flag from extremity of dash to corresponding position on opposite side of body. (*b*) With lamp or helio. Send succession of dashes. Both methods are answered by reader repeating same signal. No abbreviations are used, all words being sent as written.

APPARATUS USED.

Flags.

Flags are of two sizes, 3′ square, with 5′ 6″ pole, and 2′ square, with 3′ 6″ pole. They are of two colours, "blue," and "white with distinguishing stripe," the former for skylines and light backgrounds, and the latter for trees and dark backgrounds. Their extreme range in England is, large flag 7 miles, small flag 4. To signal with large flag grasp extremity of butt with left hand in line with waist belt, right hand grasping pole 8 inches below flag, in line with forehead in a vertical line with left shoulder. With small flag, grasp extremity of butt with left hand in line with the mouth, right hand 8 inches above it, flag at the ready. The flag should be waved so that the point describes an elongated figure of eight. Stand square to distant station when sending, and hold flag sufficiently high to see under it when in motion. Between words and when reading, flag should be concealed, both hands in line with waist, flag gathered in.

Heliograph.

Range.

Limited only by length of vision, has been read in South Africa 130 miles.

Advantages and Disadvantages.

The heliograph is a portable, secret, and rapid means of communication, whilst its range is greater than any other instrument used in visual signalling. It is, however, entirely dependent on favourable atmospheric conditions, and requires considerable skill and practice to manipulate, as mirror must be continually moved to coincide with apparent movement of the sun ; it is easily put out of order by rough or unskilful handling.

Method of Sending.

Similar to that of a dummy key, but, in addition, a horizontal and vertical motion is maintained on the signalling mirror.

Limelight.

Range.

In England up to 15 miles. In clearer atmospheres considerably more.

Advantages and Disadvantages.

It is a rapid and secret method of communication, and has a long range. It is, however, very cumbersome, as, in addition to the lamp, gas bags, tubing, lime pencils, gas mixture, retorts, and wash bottles must be carried. It is practically impossible to carry gas in bags, particularly in hot climates. It is therefore necessary to make gas after each halt before commencing work. This entails the lighting of a fire, which is not always possible or expedient on service.

Method of Sending.

Similar to that of dummy key, key being fixed on a shutter in front of lenses.

Large Limelight.

Has the same general principles as small limelight, but is more complicated.

Range.

Its range is so far unknown; has been read 80 miles in South Africa without glasses.

A serious defect in the present pattern lamp is that the auxiliary vapourising spirit chamber, having only a pin-hole burner, is liable to blow out at the slightest air movement. This may be overcome to a great extent by building a sangar to windward, but at high altitudes it will always be found difficult to keep up vapour supply through this cause.

Begbie Lamp.

The Begbie is an oil lamp with six-inch bullseye. A flat wick is used in a circular burner. Burns kerosene, the reservoir holding ¾ pint, a 10 hours' supply. Spare oil and chimneys are contained in lamp box.

Range.

Up to 10 miles in England, in clearer atmospheres considerably more.

Advantages and Disadvantages.

The lamp is strong, easily manipulated, and can be resorted to without any previous preparation. Its principal defect is a noisy shutter action, on still nights signals can be read by ear up to 600 yards, and the presence of the lamp detected at a still greater range. It is also too heavy to be carried for any great distance, a lamp in box weighing 35½ lbs.

PLATE 128.

MORSE

A	· —	S	· · ·
B	— · · ·	T	—
C	— · — ·	U	· · —
D	— · ·	V	· · · —
E	·	W	· — —
F	· · — ·	X	— · · —
G	— — ·	Y	— · — —
H	· · · ·	Z	— — · ·
I	· ·	1	· —
J	· — — —	2	· · —
K	— · —	3	· · · — —
L	· — · ·	4	· · · · —
M	— —	5	·
N	— ·	6	— · · · ·
O	— — —	7	— — · · ·
P	· — — ·	8	— · ·
Q	— — · —	9	— ·
R	· — ·	0	—

The following miscellaneous signals are used :—

AAA (used to separate sender's number, etc., from text of message)	·— ·— ·—	
Full stop	·—·—·—	
Oblique stroke . . .	·—··—	
Horizontal bar . . .	—··— ·	
Underline	··——·—	Sent before and after the words to be so treated.
Brackets or Parentheses	—·——·—	
Inverted commas . . .	·—··—·	
Hyphen	—····—	
Break signal (separating addresses from message)	—···—	
Divider (separating whole numbers and fractions) .	—— ——	

SEMAPHORE.

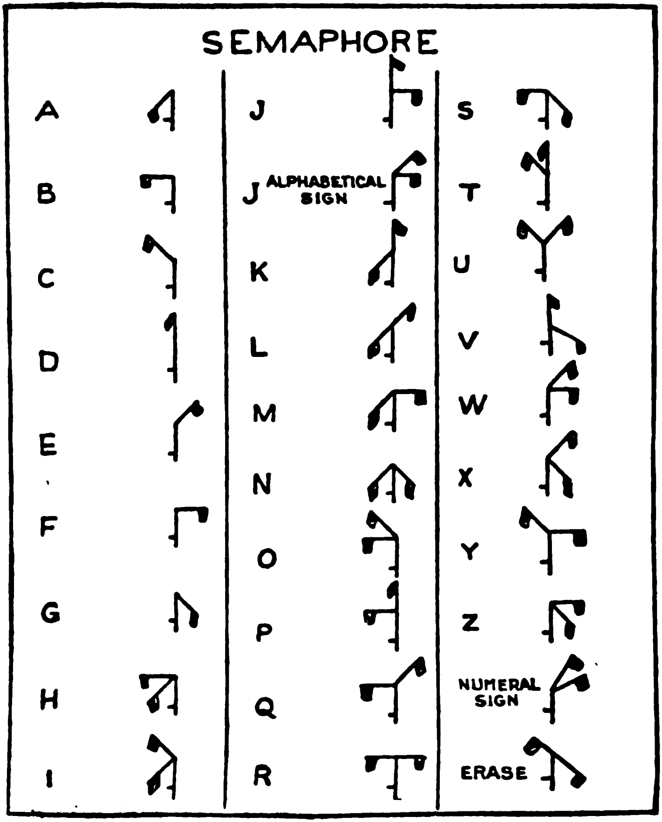
The semaphore alphabet is set out on Plate 129. Semaphore is the quickest and handiest method of visual signalling. It is easily learned, but requires constant practice to keep up.

The simplest method of learning the semaphore alphabet is by means of a series of circles in which the right arm is used as an indicator and the left arm revolved around it. The circles are 1st, A to G; 2nd, H to N (omitting J); 3rd, O to S; 4th, T, U, Y and erase; 5th, numeral sign J, V; 6th, W, X; 7th, Z. In sending, stand square to distant station, feet one pace apart. Between words and when reading, flags will be held tips together between feet, at ready position.

Sending Messages on Semaphore.

To attract the attention of an unknown station the letter J is made and flags waved. The procedure is as for sending message on Morse (see p. 858). Before sending figures the numeral sign (Plate 129) is sent, and when the figures are finished the alphabetical sign (J).

PLATE 129.


SEMAPHORE
A
B
C
D
E
F
G
H
I
J
J ALPHABETICAL SIGN
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
NUMERAL SIGN
ERASE

ABBREVIATIONS.

Abbreviations will be sent as written and written as received, no signalling abbreviations being employed.

The following are the principal abbreviated addresses officially recognized :—

Inspector-General of Communications	Communications.
Director of Army Signals	Signals.
„ Supplies	Supplies.
„ Ordnance Services	Ordnance.
„ Transport	Transport.
„ Railways	Railways.
„ Works	Works.
„ Remounts	Remounts.
„ Veterinary Services	Vet.
„ Medical „	Medical.
„ Postal „	Postal.
Deputy Judge Advocate-General	Advocate.
Principal Chaplain	Chaplain.
Provost Marshal	Provost.

Messages for headquarters of units or formations will be addressed by its title in an abbreviated form, *e.g.* First Army, First Div., Seventh Inf. Bde., Second F.A. Bde. The abbreviation H Q will be used for general headquarters only.

MISCELLANEOUS SIGNALS.

Full Stop	AAA*	Brackets or parentheses.	KK
Oblique Stroke	LT	Inverted Commas	RR
Horizontal Bar	NR	Hyphen	NV
Underline	UK	Break Signal	II

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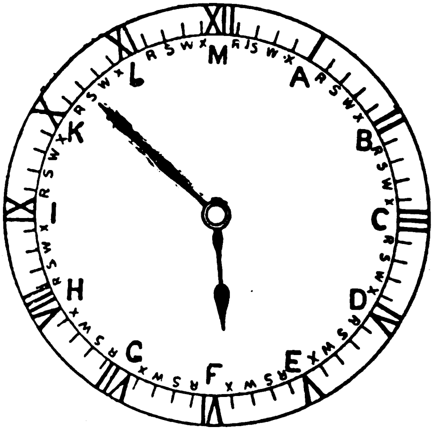
* It should also be used to separate "sender's number," "date," and "In reply to number" from the text of message.

CLOCK CHECK.

The following is the method, both in the Morse and Semaphore Code, of sending a signal quoting time. The hour is represented by the first letter, and the minute by the second, and, if necessary, the third letter. For instance, if the time is six minutes past one o'clock, the signal is AAR; if it is twenty-six minutes past seven the signal is GER. The letters "a.m." or "p.m." are always sent in conjunction with the letters representing the time, *e.g.* AAR a.m., or GER p.m. This is acknowledged in the ordinary way.



APPENDIX II.

CIPHERS.

PLAYFAIR.

To use this cipher, draw a square and divide it into twenty-five smaller squares; then insert the first letter of the keyword (which in the example selected is " Journal ") in the top left hand corner, and the remaining letters in every *third* square, counting horizontally from left to right, as shown below.

After all the letters of the keyword have been filled in, write the remaining letters of the alphabet in the same way in every third square, omitting however, any letters which have already occurred in the keyword. After the right-hand bottom square has been filled in, continue in the same way, namely, from the third square on the top line, the remaining letters of the alphabet, until all the squares have been thus filled. The letters I and J are counted as the same letter, and accordingly the alphabet will fill the twenty-five squares.

J	Q	D	O	S
E	U	T	F	R
V	G	N	W	H
A	X	K	L	Y
M	B	Z	P	C

In order to encipher a message, it should be written in full and the letters of the message then divided into pairs. For instance, if the message reads, " The hill was stormed," the letters would be paired as follows :—

TH | EH | IL | LW | AS | ST | OR | ME | D

If, when the letters of the text have been divided into pairs, any pair is found to be composed of two of the same letter, or one letter at the end of the message is unpaired, a dummy or bogey letter, such as Q, X, or Z, which is not likely to mislead the receiver of the message, must be introduced. For instance, the message, "Artillery massed at Santon," when divided into pairs for the purpose of ciphering, would accordingly read as follows:—

AR | TI | LQ | LE | RY | MA | SQ | SE | DA | TS | AN | TO | NQ

The next step is to find the equivalent for each pair of letters. This is done in the following way.

If the letters of a pair are in the same vertical line in the above diagram, each letter is represented in cipher by that which stands next below it, and letters in the bottom line by those at the top of the same columns, *e.g.* VM would be represented by AJ.

If the letters of a pair are in the same horizontal line, each letter is represented by that which stands next on its right, and the letters in the columns on the extreme right by those on the extreme left of the same horizontal line; *e.g.* QS would be represented by DJ.

If the letters of a pair are at opposite corners of some rectangle, the two letters are represented by those which stand at the two remaining angles of the rectangle, each letter by that which is in the same horizontal line with it, *e.g.* EK being at the opposite corners of rectangle, ETAK would be represented by TA.

When the message, "Artillery massed at Santon," is enciphered in the manner stated above it would read

Y E E D X O A F H C J M J D J R J K R D K V F D G D

and when written in groups of five letters for despatch by telegram—

YEEDX OAFHC JMJDJ RJKRD KVFDGD

the dummy letter Q having been introduced in three places.

Should the message end with less than five letters, bogey letters must be added to the last group, in order that it may consist of 5 letters; for instance, if the message is, "The hill was stormed," the cipher equivalent of the message when written on the form would run—

THEHI LLWAS STORM EDXYZ

When deciphering a message written in this cipher, first divide the letters of the message into pairs, then find the equivalent for each pair.

In cases where these pairs are at opposite corners of a diagram, the equivalents will be the two letters which stand at the remaining corners of the diagram, each letter is represented by that which is in the same horizontal line with it.

In cases where the pairs are in the same vertical line, the equivalents will be the letters which are next immediately above them. If the letter is in the top line, the equivalent is the letter at the bottom of the same column.

In cases where the pairs are in the same horizontal line, the equivalents will be the letters on their immediate left. If the letter is on the extreme left of a line, the equivalent is the letter on the extreme right of the same horizontal line.

BEAUFORT CRYPTOGRAPH.

A message to be enciphered by means of the Beaufort cipher should be transcribed in full and exactly under it letter for letter should be written the key words, which may consist of a short sentence or any combination of words. The key words must be repeated as often as necessary, *e.g.*

Message:	Prepare to march at daybreak
Key	Lestwef or getLe st weforget

To encipher this message, take the first letter of the first word, namely p. Look for p in the left-hand column of the following table, then let the eye travel in a horizontal direction along the column in which the letter is written until "l" the first letter of the first word of the key is found. Then cast the eye up the column in which this "l" is written and the top letter of that column, namely w, will stand as the cipher equivalent of p. When this has been done, proceed to encipher the second and all subsequent letters of the message in the same way. The letters (j) and (i) are sometimes used for one another in accordance with the note prefixed to the table.

The message when then enciphered will read :—

Wooewob vd vecix sa tehnacek

Cipher letters are divided into groups of five for despatch by telegram, thus :—

wooew obvdv ecixs atehn acek

If sent otherwise than by telegram, they may be written continuously without breaks to show the lengths of the words.

Though the table will always be found the most convenient way of enciphering and deciphering messages sent in this cipher, an equivalent for the table may be formed by writing out the alphabet (omitting j) and numbering the letters from zero to 24 thus :

0	1	2	3	4	5	6	7	8	9	10	11	12
A	B	C	D	E	F	G	H	I	K	L	M	N

13	14	15	16	17	18	19	20	21	22	23	24
O	P	Q	R	S	T	U	V	W	X	Y	Z

When j occurs in the original message, i is taken as its equivalent. In deciphering a message i will therefore sometimes be found to stand for j.

a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a
b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b
c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c
d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d
e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e
f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f
g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g
h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h
i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i
k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k
l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l
m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m
n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n
o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p
q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q
r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r
s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s
t	u	v	w	x	y	z	a	b	c	d	e	t	g	h	i	k	l	m	n	o	p	q	r	s	t
u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u
v	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v
w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w
x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x
y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y
z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a

This numbered alphabet is then used in accordance with one or other of the following formulæ.

(1) $b - a = c$
(2) $25 + b - a = c$; in both of which

a represents the message letter.
b represents the key letter.
c represents the cipher letter.

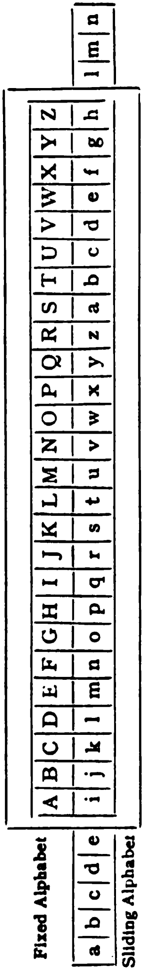
The first of the above formulæ is used if b has a higher numerical value in the alphabet than a; the second if b has a lower value.

The process of enciphering the foregoing message by means of the numbered alphabet would thus be

a. P r e p a r e t o.
b. L e s t w e f o r.

$$\begin{array}{l}
25 + L - P = 35 - 14 = 21 = W \\
25 + e - r = 29 - 16 = 13 = O \\
S - e = 17 - 4 = 13 = O \\
T - p = 18 - 14 = 4 = E \\
W - a - 21 - 0 = 21 = W \\
25 + e - r = 29 - 16 = 13 = O \\
F - e = 5 - 4 = 1 = B \\
25 + O - t = 38 - 18 = 20 = V \\
r - o = 16 - 13 = 3 = D \\
\quad \&c. \quad \&c. \quad \&c.
\end{array}$$

The resulting cipher message is the same as when the table is used.


Fixed Alphabet
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Sliding Alphabet
a b c d e
i j k l m n o p q r s t u v w x y z a b c d e f g h
l m n

SLIDING ALPHABET CIPHER.

This cipher is worked by means of the simple device shown opposite, which each correspondent can make for himself with a sheet of ordinary writing paper.

The fixed alphabet consists of a broad strip of paper on which 26 divisions of exactly equal length are marked off, and in each of these one letter of the alphabet is written. This strip has a slit at either end, just below and outside the first and last divisions. Through these slits is passed the sliding alphabet, a long narrow strip of paper containing 52 divisions of exactly equal length to those of the fixed alphabet. The alphabet is written out twice on this strip, a letter to each division.

To use this cipher a short keyword, *e.g.* "FRANCE" is chosen, and the message is divided up into sections, each containing as many letters as the keyword. The sliding alphabet is then adjusted so as to bring the first letter of the keyword below the "A" of the fixed alphabet. The first letter of the message is then looked for in the sliding alphabet, and the letter immediately above it in the fixed alphabet is the first letter of the enciphered message. The second letter of the enciphered message is obtained similarly by adjusting the sliding alphabet so as to bring the second letter of the keyword under A of the fixed alphabet, and taking the letter in the fixed alphabet standing above the second letter of the message in the sliding alphabet. The process is repeated as regards each of the remaining letters of the message.

Applying it to the message: "Enemy's fleet sighted," and taking "France" as the keyword, the sections will be:

Enemys fleets ighted

the cipher message will be:—

ZWEZWO FUERRO DPHGCZ

or when distributed into sections of five letters:—

ZWEZW OFUER RODPH GCZ

In order to decipher such a message the receiver distributes the letters composing it into sections each containing as many letters as the keyword; then, by means of the fixed and sliding alphabets, he finds the true letters corresponding to the first letter of each of the said sections and, successively, those corresponding to the second and subsequent letters, until the whole text is obtained.

This cipher may be varied as follows:—

(*a*) By using the alphabet set to the first letter of the keyword for all the letters of the first word of the message, changing to the second letter of the keyword for all the letters of the second word, to the third for the third word, and so on.

(*b*) By arranging that the sliding alphabet shall be set by bringing the letters of the key word, not under the A but under P or any other letter agreed on.

This cipher is untrustworthy for messages of any length.

APPENDIX III.

EQUIVALENTS.

DISTANCES AND COINS.

	English miles.	Kilometres.
Austrian mile = 4000 Vienna fathoms of 6 Vienna feet each	4·71	7·58
Belgian league (lieue de poste à 4000 toises)	4·84	7·70
Burmah 1 Dain	2·430	3·91
China 1 Li	·362	·22
China 1 Po	3·0	4·83
Danish mile	4·68	7·53
Dutch uur	3·45	5·56
English mile	1·0	1·61
French lieue commune (2280 toises)	2·75	4·44
French lieue de poste à 2000 toises	2·42	3·9
Geographical mile, 60 = 1 degree of longitude at the equator	1·15	1·85
German mile	4·67	7·50
Indian mile	1·0	1·61
Japanese Ri	2·440	3·928
Kilometre	0·621	1·0
Nautical mile or knot, 6080 feet = 8·4 cables	1·15	1·85

	English miles.	Kilometres.
Norwegian mile	7·021	11·299
Portuguese legua	3·83	6·18
Russian verst = 1500 arschines . . .	0·664	1·07
Swedish mile of 36,000 Swedish feet .	6·07	10·69
Swiss mile or stunde of 16,000 Swiss feet	2·98	4·80
Turkish agatsch	3·1159	5·016

FOREIGN MONEYS.

France and Belgium.

Coins in use.		Approximate value in English money taken at the average of exchange.
Napoleon	=	16/–
Demi-Napoleon	=	8/–
5 Francs	=	4/–
3 ,,	=	2/4½
2 ,,	=	1/7
1 ,,	=	9½d.
50 Centimes	=	4¾d.
25 ,,	=	2¼d.
10 ,,	=	1d.

Germany.

20 Marks	=	20/–
10 ,,	=	10/–
5 ,,	=	5/–
2 ,,	=	2/–
1 ,,	=	1/–
50 Pfennige	=	6d.
10 ,,	=	1¼d.

METRIC SYSTEM.

The metric system is in use in Austria-Hungary, Belgium, France, Germany, Greece, Italy, Norway, Portugal, Roumania, Servia, Spain, Mexico, and most South American countries.

Metric Notation.

Milli- = $\frac{1}{1000}$ of a unit
Centi- = $\frac{1}{100}$,, ,,
Deci- = $\frac{1}{10}$,, ,,
Deka- = 10 units.
Hecto- = 100 ,,
Kilo- = 1000 ,,
Myria- = 10,000 ,,
Quintal- = 100,000 ,,

WEIGHTS.

Pounds to Kilos (Factor × 4½ ÷ 10).

		Kg.	Hg.	Dg.	Gr.
1 Pound	=	–	4	5	4
2 ,,	=	–	9	0	7
7 ,,	=	3	1	7	5
14 ,,	=	6	3	5	0
28 ,,	=	12	7	0	1
56 ,,	=	25	4	0	1

Kilos to Pounds (Factor × 2¼).

		Cwt.	Qrs.	Lbs.	Ozs.
1 Kilo	=	–	–	2	3¼
2 ,,	=	–	–	4	6½
5 ,,	=	–	–	11	0¼
10 ,,	=	–	–	22	1
20 ,,	=	–	1	16	1
50 ,,	=	–	3	26	4

LONG MEASURE.

Yards, Chains, and Fathoms to metres.

	Km.	Hm.	Dkm.	Mtr.	Dm.	Cm.	Mm.
1 Inch =	–	–	–	–	–	2	$5\frac{1}{2}$
1 Foot =	–	–	–	–	3	0	5
1 Yard =	–	–	–	–	9	1	$4\frac{1}{3}$
1 Fathom =	–	–	–	1	8	2	9
1 Pole =	–	–	–	5	0	2	9
1 Chain =	–	–	2	0	1	1	7
1 Furlong =	–	2	0	1	1	6	8
1 Mile =	1	6	0	9	3	4	3
2 ,, =	3	2	1	9	–	–	–
5 ,, =	6	4	3	7	–	–	–
10 ,, =	16	0	9	1	–	–	–

(Factor Miles to Kilometres × 5 ÷ 3)

Metres to Yards, Chains, and Miles.

	Ml.	Fur.	Ch.	P.	Fa.	Yd.	Ft.	In.
1 Millimetre =	–	–	–	–	–	–	–	$0\frac{1}{25}$
1 Centimetre =	–	–	–	–	–	–	–	$0\frac{3}{8}$
1 Decimetre =	–	–	–	–	–	–	–	4
1 Metre =	–	–	–	–	–	1	0	$3\frac{3}{8}$
1 Dekametre =	–	–	–	1	2	1	1	4
1 Hectometre =	–	–	4	3	2	0	2	7
1 Kilometre =	–	4	9	2	2	0	1	10
2 ,, =	1	1	9	1	1	1	1	6
5 ,, =	3	0	8	2	0	1	0	0
{ 10 ,, or { 1 Myriametre =	6	1	6	3	0	1	1	6

(Factor Kilometres to Miles × 5 ÷ 8).

Miles to Kilometres.

	Km.	Hm.	Dkm.	M.
1 Mile =	1	6	0	9
2 ,, =	3	2	1	9
3 ,, =	4	8	2	8
4 ,, =	6	4	3	7
5 ,, =	8	0	4	7
6 ,, =	9	6	5	6
7 ,, =	11	2	6	5
8 ,, =	12	8	7	5
9 ,, =	14	4	8	4

Kilometres to Miles.

	Ml.	Fur.	Yds.
1 Kilometre =	–	4	213
2 ,, =	1	1	207
3 ,, =	1	6	201
4 ,, =	2	3	194
5 ,, =	3	0	188
6 ,, =	3	5	181
7 ,, =	4	2	175
8 ,, =	4	7	169
9 ,, =	5	4	162

CAPACITY.

Gallons, Bushels, and Chaldron to Litres.

	Kl.	Hl.	Dkl.	L.	Dl.	Cl.	Ml.
1 Gill =	–	–	–	–	1	4	2
1 Pint =	–	–	–	–	5	6	8
1 Quart =	–	–	–	1	1	3	6½
1 Gallon =	–	–	–	4	5	4	6
1 Peck =	–	–	–	9	0	9	2
1 Bushel =	–	–	3	6	3	6	7½
1 Quarter =	–	2	9	0	9	4	1½
1 Chaldron =	1	3	0	9	2	3	7½

Litres to Gallons, Bushels, and Chaldrons.

		Chl.	Qr.	Bus.	Pk.	Gal.	Qt.	Pt.	Gl.
1 Millilitre	=	–	–	–	–	–	–	–	$0\frac{1}{143}$
1 Centilitre	=	–	–	–	–	–	–	–	$0\frac{1}{14}$
1 Decilitre	=	–	–	–	–	–	–	–	$0\frac{3}{4}$
1 Litre	=	–	–	–	–	–	–	1	3
1 Dekalitre	=	–	–	–	1	0	0	1	$2\frac{1}{4}$
1 Hectolitre	=	–	–	2	2	1	3	1	4
1 Kilolitre	=	–	3	3	1	1	3	1	3
1 Myrialitre	=	7	2	6	3	1	3	0	0

Conversion of Thermometer Scales.

1 deg. Fahren. = ·55 degs. Centigr. = ·44degs. Réaumur.
1 „ Centigr. = 1·80 „ Fahren. = ·80 „ Réaumur.
1 „ Réaumur = 2·25 „ „ = 1·25 „ Centigr.

$$\frac{(\text{Degrees Fahrenheit} - 32) \times 5}{9} = \text{degrees Centigrade.}$$

$$\frac{(\text{Degrees Fahrenheit} - 32) \times 4}{9} = \text{degrees Réaumur.}$$

$$\frac{\text{Degrees Centigrade} \times 9 + 32}{5} = \text{degrees Fahrenheit.}$$

$$\frac{\text{Degrees Centigrade} \times 4}{5} = \text{degrees Réaumur.}$$

SPECIAL MEASURES.

Cubic Timber Measure.

Cubic feet to Steres, Decisteres, Centisteres, and Millisteres.

			Stere.	Ds.	Cs.	Ms.
1 Cubic Foot		=	–	–	2	8
40 „ Feet	(1 load of round)	=	1	1	3	3
50 „ „	(1 load of sawn)	=	1	4	1	6
108 „ „	(½ fathom of sawn)	=	3	0	5	8
120 „ „	(1 cord of wood)	=	3	3	9	8

(Factor Cubic feet to Decisteres × 28 ÷ 10).

Forage.

Pounds, Truss, and Loads, to Quintals, Myriagrammes and Kilogrammes.

Old Hay.		Q.	Myg.	Kg.	Hg.
56 lbs. = 1 truss	=	–	2	5	4
18 cwt. (2016 lbs.) = 36 truss	=	9	1	4	4
New Hay.		**Q.**	**Myg.**	**Kg.**	**Hg.**
60 lbs. = 1 truss	=	–	2	7	2
19 cwt. 32 lbs. (2160 lbs.) = 36 truss	=	9	7	9	8
Straw.		**Q.**	**Myg.**	**Kg.**	**Hg.**
36 lbs. = 1 truss	=	–	1	6	3
11 cwt. 64 lbs. (1296 lbs.) = 36 truss = 1 load	=	5	8	7	9

Quintals and Myriagrammes to Pounds, Truss, and Loads.

		Straw.			Old Hay.			New Hay.			–
		Loads.	Truss.	Lbs.	Loads.	Truss.	Lbs.	Loads.	Truss.	Lbs.	Lbs.
1 Myriagramme	=	0	0	22	0	0	22	0	0	22	22
1 Quintal	=	0	6	4	0	3	52	0	3	4	220½
1 Millier	=	1	25	8	1	3	20	1	0	44	2204

Flour.

Sold nominally by measure but actually by weight.

Quarters and Bushels to Quintals, Myriagrammes, and Kilogrammes.

		Q.	Myg.	Kg.	Hg.
1 Quartern (¼ Peck) 3½ lbs.	=	–	–	1	6
1 Gallon = 7 lbs.	=	–	–	3	2
1 Peck = 14 lbs.	=	–	–	6	4
1 Bushel = 56 lbs.	=	–	2	5	4
1 Sack = 280 lbs.	=	1	2	7	0

Litres and Kilogrammes to Quarterns, Bushels, and Pounds:

	Lbs.	Bu.	Pk.	G.	Qt.	Pt.
1 Litre = 1 Kilogramme =	2¼	–	–	–	–	1¾
1 Dekal = 1 Myriagr. =	22	–	1	0	0	1½
1 Hectol = 1 Quintal =	220½	2	2	1	3	1½

Cubic capacity of given weights of articles of supply and the metric equivalent of those weights.

Hay.

7 Trusses new hay = 5 c³ yards = 3·8 steres.
15 ,, old hay = 7 c³ yards = 5·4 steres.

Coal.

25 Bushels = 1 ton = 30 c³ feet = 9·09 hectolitre = 1·01 milliers = 0·85 steres.

1 Millier = 9 hl. = 0·84 steres = 19½ cwts. = 24¾ bushels = 29·6 cubic feet.

Oats or Malt.

56 Bushels = 1 ton = 72 cubic feet = 20·36 hl. = 1·01 milliers = 2 steres.

1 Millier = 20·1 hl. = 1·9 steres = 19½ cwts. = 55¼ bushels = 67 cubic feet.

Wheat.

37 Bushels = 1 ton = 48 cubic feet = 13·46 hl.=. 1·01 milliers = 1·359 steres.

1 Millier = 13·32 hl. = 1·355 steres = 19½ cwts. = 36·6 bushels = 47·8 cubic feet.

Barley and Paddy.

45 Bushels = 1 ton = 58 cubic feet = 16·37 hl. = 1·01 millier = 1·642 steres.

1 Millier = 16·21 hl. = 1·625 steres = 19½ cwts. = 44·5 bushels = 57 cubic feet.

Salt and Meal.

40 Bushels = 1 ton = 51 cubic feet = 14·5 hl. = 1·01 millier = 1·444 steres.

1 Millier = 14·3 hl. = 1·42 steres = 19½ cwt. = 39·4 bushels = 50 cubic feet.

FACTORS.

The following factors will be found useful where approximations only are required of moderate quantities.

Pounds to Kilos × 4½ ÷ 10, or × 0·4536.
Cwts. to Quintals ÷ 2 or × 0·508.
Tons to Milliers × 102 ÷ 100 or × 1·016.
Kilos to Pounds × 2¼ or × 2·205.
Quintals to Cwts. × 1 9/10 or × 1·97.
Milliers to Tons × 9/10 or × 0·9842.
Gallons to Litres × 4½ or × 4·55.
Bushels to Hectolitres ÷ 3 or × 0·364.
Quarters to Hectolitres × 2 9/10 or × 2·909.
Acres to Hectares × 4 ÷ 10 or × 0·405.
Square Miles to Hectares × 259.
Square Miles to Square Kilometres × 2·59.
Hectares to Acres × 2½ or 2·47.
Hectares to Square Miles × 0·004 or 0·00386.
Square Kilos to Square Miles × 0·386.
Yards to Metres × 9 ÷ 10 or deduct 1/10 or × 0·9144.
Miles to Kilometres × 1·609.
Metres to Yards, add 1/10.
Kilometres to Miles × 5 ÷ 8 or × 0·62.
N.B.—1 Kilometre = nearly 5 Furlongs.
2 Deckametres = 1 Chain.
1 Knot or Geogr. Mile = 1·853 Kilometre.

NOTE.—A Knot according to Admiralty reckoning is 6800 feet.

Approximate Equivalents.

1	Bushel	Barley	= 50 lbs.	= 22·68 Kilos	= 0·364 Hl.
1	,,	Malt	= 40 ,,	= 18·14 ,,	= ,,
1	,,	Salt or Meal	= 56 ,,	= 25·4 ,,	= ,,
1	,,	Wheat	= 60 ,,	= 27·22 ,,	= ,,
1	,,	Paddy	= 50 ,,	= 22·68 ,,	= ,,
1	,,	Oats	= 40 ,,	= 18·14 ,,	= ,,
1	Hectolitre	Barley	= 2·75 bushel	= 137 lbs.	= 62 Kg.
1	,,	Malt	= ,, ,,	= 110 ,,	= 50 ,,
1	,,	Salt	= ,, ,,	= 154 ,,	= 70 ,,
1	,,	Wheat	= ,, ,,	= 165 ,,	= 75 ,,
1	,,	Paddy	= ,, ,,	= 137 ,,	= 62 ,,
1	,,	Oats	= ,, ,,	= 110 ,,	= 50 ,,

General Practice.

Metric commercial weights are usually expressed in terms of kilogrammes for light and tonnes for heavy goods. Grammes and their subdivisions being used in science and medicine.

Liquids are usually expressed in litres, corn and dry measures in hectolitres. Medical and scientific quotations are generally given in cubic centimetres, which are practically identical with millilitres.

Further information on Metric and English weights will be found in "The Metric and English Weights and Measures," compiled and published by Mr. Radley, 30, Theobald's Road, London.

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ZEALAND, NEW (see New Zealand).

PLATE 130.

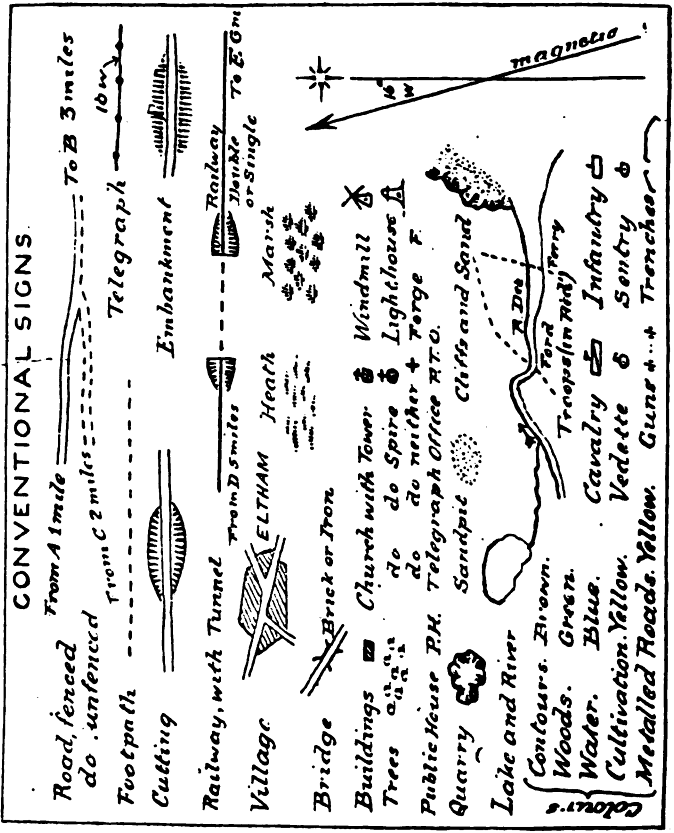

CONVENTIONAL SIGNS
Road, fenced
do .unfenced
From A 1 mile
To B 3 miles
From C 2 miles
Footpath
Telegraph
10 w
Cutting
Embankment
Railway, with Tunnel
From D 5 miles
Railway
Double or Single
To E. Gn
Village
ELTHAM
Heath
Marsh
Bridge
Brick or Iron
Buildings
Church with Tower
Windmill
Trees
do do Spire
Lighthouse
do do neither
Forge F
Public House P.H.
Telegraph Office T.O.
Quarry
Sandpit
Cliffs and Sand
Lake and River
R. Dee
Ford
Ferry
Troops (in Red)
Colours
Contours. Brown.
Woods. Green.
Water. Blue.
Cultivation. Yellow.
Metalled Roads. Yellow.
Cavalry
Infantry
Vedette
Sentry
Guns
Trenches
16° W
magnetic

PLATE 131.

FIG I

Scale. 2" to 1 Mile

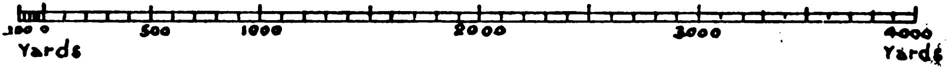
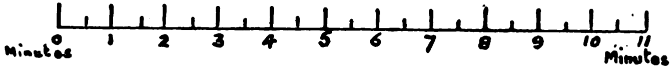
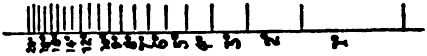

100 0
Yards
500
1000
2000
3000
4000
Yards

FIG II


0
Minutes
1
2
3
4
5
6
7
8
9
10
11
Minutes

TROT SCALE ·27 OF INCH = 1 MINUTE

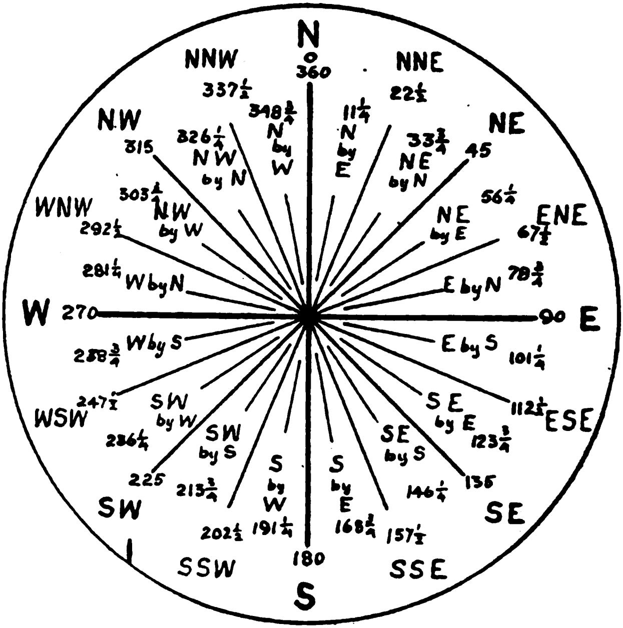
FIG III



SCALE OF HORIZ^L EQUIV^T

CONTOURS AT 25' V.I 2" 1 MILE.

PLATE 132.


N
0
360
NNW
NNE
337½
22½
348¾
N by W
11¼
N by E
NW
315
326¼
NW by N
33¾
NE by N
NE
45
303¾
NW by W
56¼
NE by E
WNW
292½
ENE
67½
281¼
W by N
78¾
E by N
W
270
90
E
258¾
W by S
E by S
101¼
247½
WSW
SW by W
112½
ESE
SE by E
236¼
SW by S
123¾
SE by S
225
213¾
S by W
S by E
146¼
135
SW
SE
202½
191¼
168¾
157½
180
SSW
SSE
S

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3 1951 P00 399 352 0